

SCIENCE.

FRIDAY, JUNE 6, 1884.

COMMENT AND CRITICISM.

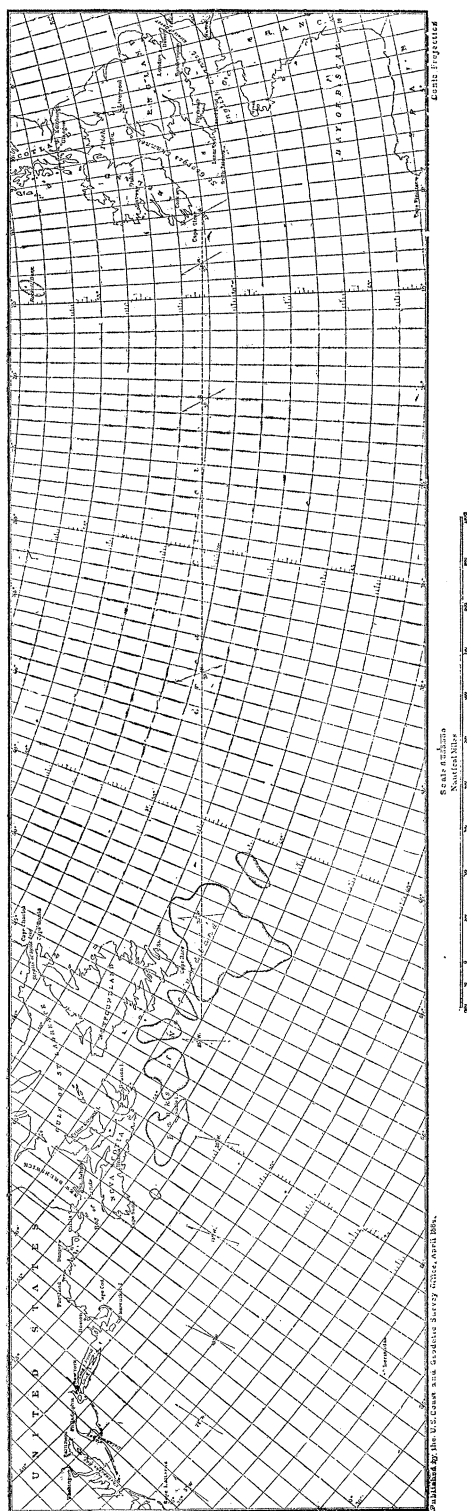
THE rapid strides made in all departments of science, and the fundamental revolutions in some of them, have increased the demand of the public and of publishers for books which shall expound, in clear and simple language, the latest discoveries. Yet publishers look at such books in some measure askance, unable, as a rule, to judge for themselves of their probably permanent or ephemeral value, and always with a very reasonable fear that they will speedily prove antiquated, and become a drug in the market. An apparent attempt to evade the little financial dilemma which the advance of knowledge presents to the vender of literary wares has recently been brought to our notice. Four books, sent us at one time for review, were first examined to see whether they were of sufficiently recent date to notice. *They bore no date.* A careful examination showed that one of them consisted of lectures delivered two or three years ago, but no clew to the age of the others could be found. It was tolerably evident that the very unusual omission was intentional. If intentional, it was, to say the least, a deliberate purpose to evade the purchaser's natural and proper question, Does this book represent present knowledge? We leave to the 'Society for the promotion of Christian knowledge,' whose imprint each of these books bore, to ask itself the question, Is such a practice defensible on the grounds of scientific, Christian, or even pagan morality?

It is a question to be considered, whether our smaller societies of natural history, to whose meetings we desire to call attention in the columns of *Science*, do not make a mistake in having no plan of work towards the accomplishment of which they can make a

united effort, instead of pursuing observation and discussion almost at random. Larger societies in the cities, where publications, and even general collections, are attempted, must naturally cover a broad field: it is not to these that we refer, but to the smaller societies that spring up, too often for but a short life, in our country towns. The desire for large membership, and the admission of members to full standing without any requirement of work accomplished, seems to us another error. Five really industrious members make a very good nucleus for a local club. Others can be added later, on the assurance of some task of local observation actually performed, and of willingness to co-operate towards some attainable end; and beyond this there may, of course, be general meetings, as public and as fully attended as possible, but full membership should in all cases mean work done.

THE coast-survey has just published a 'North-Atlantic track-chart,' executed with the beautiful neatness characteristic of its work, "to illustrate the point, that, in the conic projection, the straight line upon the plane surface of the chart almost exactly represents the great circle contained between its termini, which on other projection will do." A reduced facsimile of the chart will be found on the next page. If this be demonstrated to obtain with sufficient closeness for all latitudes and all courses, the conic projection, in which a part of the earth is represented on a conical surface, tangent or secant about the middle latitudes of the region represented, should replace the common Mercator's or cylindric projection of ordinary sailing-charts, in which great distortion is caused by throwing the geographic lines on a cylinder tangent to the earth's equator.

The advantage usually quoted for the latter projection is, that it enables the navigator to lay out a course having a constant bearing



throughout his ocean-voyage: but this advantage is largely fictitious; for, with better knowledge of winds and currents, it is now seldom found advisable for sailing-vessels to follow such a route; and steamers, that can afford to pay little attention to the weather, prefer the great circle, or shortest-line course, to the longer one, so easily determined on the Mercator chart. The difficulty that stands in the way of the general adoption of great-circle sailing is the complexity of the calculation required in laying out the track to be followed. If this difficulty can be overcome by the use of the conic projection, then the owners of vessels desirous of quick passages can hardly fail to demand its introduction.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

A colt and its mother's blanket.

My attention was called recently to the peculiar actions of an orphan colt, which perhaps are worth recording. When the colt was two weeks old, its mother died. Previous to her death, she was covered with a blanket. When it was apparent she could not live, the blanket was thrown over the fence, and the mare removed, and the colt left in the enclosure. The colt was very much exercised at first, ran up and down the yard neighing; but, when it came near the blanket on the fence, it stopped, smelled of it, and seemed pacified. It evidently considered the blanket its mother, and has continued to do so.

If the blanket is removed from the fence, the colt becomes restless, runs about neighing, but is reconciled by the sight of the blanket again.

If one throw the blanket over his back, the colt will follow the bearer all about.

It will graze about in the vicinity of the blanket, but will not go far away, and, when it wishes to rest, will go and lie down by it.

F. L. HARVEY.

Fayetteville, Ark., May 20.

The invention of the vertical camera in photography.

In a footnote accompanying an article by Mr. Simon H. Gage, printed in this journal under date of April 11, 1884, on the application of photography to the production of natural-history figures, it was stated, that the only other persons employing a vertical camera in photography, known to the writer, were Dr. Theo. Deecke of the State lunatic-asylum at Utica, N.Y., and Dr. Dannadiou of Lyons, France.

As a matter of fact, the vertical camera, now used for photographing natural-history specimens, etc., is the outcome of a suggestion made in December, 1869, by Professor Baird to Mr. T. W. Smillie, the photographer in the U. S. national museum, Washington, D.C., that the instrument be placed on an incline; the former having observed the difficulty experienced in photographing with the horizontal camera such objects as stone implements, fish, etc. This sugges-

tion was acted upon; and in the following year (1870) Mr. Smillie invented the vertical camera, and with it introduced the use of a side-light, which produced the same effect as the skylight with the horizontal camera. Mr. Smillie also attached to the side of the apparatus an endless screw, whereby the distance could be readily regulated between the lens and the object to be photographed. In 1871, and again in 1875, a camera of this kind was constructed specially for photographing the marine animals taken by the U. S. fish-commission at Wood's Holl, Mass. Its advantages were readily seen by Professor Agassiz, who asked and obtained Professor Baird's permission to construct for his own work a camera on a similar principle. Not less than six thousand negatives have been taken with the vertical camera by Mr. Smillie. G. BROWN GOODE.

A tailed child.

The *Commercial* of this city for the 17th and 18th inst. gave accounts of a tailed child recently born here. As such cases are of scientific interest, and are very rare, a party of four, including a prominent doctor and the writer, concluded to investigate the case.

We found a female negro-child, eight weeks old, normally formed in all respects, except that slightly to the left of the median line, and about an inch above the lower end of the spinal column, is a fleshy pedunculated protuberance about two and one-half inches long. At the base it measures one and one-quarter inches in circumference. A quarter of an inch from the base it is somewhat larger, and from that it tapers gradually to a small blunt point. It closely resembles a pig's tail in shape, but shows no signs of bone or cartilage. There seems to be a slight mole-like protuberance at the point of attachment. The appendage has grown in length about a quarter of an inch since the birth of the child.

The mother, Lucy Clark, is a quadroon, seventeen years old, and the father, a negro of twenty, — both normally formed.

In Darwin's 'Descent of man,' vol. i. p. 28, he speaks of a similar case, and refers to an article in *Revue des cours scientifiques*, 1867-68, p. 625. A more complete article is that by Dr. Max Bartels, in *Archiv für anthropologie* for 1880. He describes twenty-one cases of persons born with tails, most of them being fleshy protuberances like the one just described. H. W. EATON.

Louisville, Ky., May 24.

Hibernating mammals.

In *Science*, No. 68, Dr. Merriam desires the evidence upon which my statements concerning the hibernation of certain mammals were based to be well sifted; and rightly, if it is true that my observations upset the well-known (?) laws that govern hibernation. Now, these 'laws' may be in force in the Adirondack region, but they are not in Central New Jersey.

I presume Dr. Merriam will admit that the squirrels and *Hesperomys* occasionally take a nap during the winter; that sleep is not wholly ignored by them. In my original communication (*Science*, No. 65), I stated very clearly that the *Hesperomys* slept much more during the winter months than at other times; that its hibernation consisted of such additional slumber, and *nothing more*. So far as the moles are concerned, I have never found evidence of activity in winter equal to that characteristic of the summer

months; and specimens kept in captivity hibernated, in the strictest sense of that term, although food was kept within reach all of the time. Of course, star-nosed moles may get out of the reach of freshets; but I have never seen evidence of this, and have often dug down to their burrows immediately the freshet subsided, and found the animals where they were when the waters began to rise. Since the appearance of Dr. Merriam's critical remarks, I have thought the matter over, and believe it probable that these moles may close the openings to their burrows so effectually as to shut out the water from the central nest. This, it must be borne in mind, is a supposition only. In conclusion, I would state that I am not given to ad-ducing facts in proof of general statements. Convinced of their essential correctness, I leave them with others to disprove or confirm by their independent observations. In the case of the 'hibernation' of certain mammals, a comparison of my original communication with the conclusions of my critic will show that there is no very marked difference in our impressions as to the habits of the animals named; and, whether 'extraordinary or improbable,' what I have said of the *Hesperomys* and star-nosed mole is not simply substantially correct, but absolutely so.

CHAS. C. ABBOTT, M.D.

May 25.

THE ROYAL SOCIETY OF CANADA.

THE third session of this society was held at Ottawa, commencing on the 20th of May, and ending on the 23d. Many members and delegates were present; among the latter, Dr. Persifor Frazer of Philadelphia, who represented the American association for the advancement of science, and Dr. C. Hart Merriam of New York, who represented the American ornithological union.

An address of welcome was presented to the new governor-general of the Dominion, the Marquis of Landsdowne, inviting him to become the honorary president of the society, to which his Excellency returned a suitable reply. The president's address was delivered by the Hon. P. J. O. Chauveau, in French, and the vice-president's by Dr. T. Sterry Hunt, in English.

On the 22d of May the members and friends of the society were invited by the Ottawa field-naturalists' club to participate in an excursion to the King's Mountain, near Chelsea, in the Laurentian country to the north of the city, which proved eminently successful.

The following officers were elected for the ensuing year: president, Dr. T. Sterry Hunt; vice-president, Dr. Daniel Wilson; treasurer, Dr. J. A. Grant (re-elected); honorable secretary, Mr. J. G. Bourinot (re-elected).

The two scientific sections of the society are the third (mathematical, physical, and chemical sciences) and the fourth (geological and

biological sciences); and our account covers only the more interesting or important papers in these two sections. A full list will be found in our Notes.

In the physical section, Mr. F. N. Gisborne, the superintendent of the government telegraph-service, described a new system, devised by himself, to obviate the evil effects of electrical induction in underground and aerial conductors. A number of diagrams were presented, illustrating the conditions obtaining in neighboring circuits; and two or more circuits arranged in the ordinary way, and the same arranged according to his method, were compared. The advantages of the latter arrangement were clearly set forth; and proofs of its efficiency were presented in a tabular statement of experiments made with a section of cable about three thousand feet in length, constructed under his direction, and laid underground between two of the departmental buildings in Ottawa. The cable contains twenty indifferently insulated conductors or wires, which are divided into pairs, two conductors being twisted together in each case. Each pair constitutes a metallic circuit, one conductor being used as a 'return,' instead of the earth-plates usually employed. The peculiarity of the invention consists in the twisting of these metallic circuit conductors, as both wires are thus made to occupy an equidistant relationship with respect to any other conductor or pair of conductors in their vicinity. It was explained, that, by this device, a current introduced into a circuit is conducted down one wire, and up the other; and, the position of both wires being the same with respect to neighboring circuits, the inductive effect of the current passing down one wire is neutralized by the inductive effect of the same current passing up the return-wire.

It was also theoretically demonstrated that the twisting of the wires of the metallic circuits lessens the effect of induction of the current upon itself. When the wires of a metallic circuit are laid parallel throughout, the current induced from one wire into the other is in the same direction as the current itself passing in that wire; the effect of the current is therefore prolonged, and retardation experienced in a marked degree: whereas, when the wires are twisted closely (say, two turns to the inch), the wires occupy throughout their length a position approaching right angles with respect to each other; and the induced currents are thereby materially lessened, and retardation rendered less appreciable.

In the discussion which followed the reading

of the paper, it transpired, that if a conductor were enclosed and insulated within another conductor (such, for instance, as a gutta-percha covered wire drawn through a metal tube), and both conductors were connected at either end with earth-plates, or other conductors, so as to form two independent closed circuits, the enclosed conductor might be employed to convey electrical currents, without any inductive effect being perceived, in a circuit extending parallel with, or in the neighborhood of, the outside conductor. The explanation of this condition is, that the outside conductor, which in this case cannot be used as a medium for communication, intercepts the induced currents on all sides of the inducing circuit, and in its closed circuit absorbs them.

As in such a system the outside conductors could not be utilized in the formation of circuits for purposes of communication, it is admitted, that, apart from the bulkiness necessarily attending it, the first cost of construction upon that plan renders the system comparatively impractical; whereas, in the system advanced by Mr. Gisborne, the construction is much cheaper, and all the conductors form an integral part of the communicating circuits, so that space is economized to the fullest extent.

A good deal of interest is being manifested in this invention which Mr. Gisborne has just now brought forward, although it has been a subject of investigation with him for some years past, the cable referred to in the paper having been ordered by the Dominion government during the summer of 1882.

Mr. R. Steckel presented a paper on the form of the contracted liquid vein, affecting the present theory of the science of hydraulics, in which the author claims to propound a new theory of the efflux of liquids, and describes experiments by which he has sought to test it.

Dr. T. Sterry Hunt, in his paper on the origin of crystalline rocks, maintained, in opposition to the plutonic and metamorphic hypotheses of the origin of these rocks, a new one, designated the *crenitic* hypothesis (Greek, *κρήνη*, 'a spring'), according to which they were formed, at an early period of the earth's history, by the agency of circulating subterranean waters rising to the earth's surface as springs. He supposes the previous existence of a chaotic layer, the last-congealed portion of a globe consolidating from the centre; which layer, rendered porous, and permeated by waters, gave up to them the materials of quartz and the felspars, after the manner of zeolites, to be deposited at the surface. The action of non-aluminous silicates, allied to pectolite or the

magnesian salts in sea-water, was the source of serpentine, pyroxene, etc. The gradual removal by solution from below, of vast quantities of material, and the resulting contraction of the primitive stratum, caused the universal corrugations of the upper acidic or gneissic layer. From the undissolved basic residual portion have come such eruptive rocks as melaphyres and basalts, while granitic and trachytic rocks are softened and displaced portions of the acidic or secondary layer. The author has developed at length this hypothesis, which, according to him, affords a satisfactory explanation of many hitherto unsolved problems in geology.

In a paper on the density and the thermal expansion of aqueous solutions of sulphate of copper, Prof. J. G. MacGregor gave an account of extended observations made to determine the density of solutions of different degrees of concentration, and at different temperatures. As a general result of the experiments, it is shown, 1°, that the rate of variation of density with temperature in all cases increases with the temperature and with the degree of concentration; 2°, that at low temperatures (below about 25° C.) the rate of change of density with temperature is for all solutions greater than the same rate for water; 3°, that the difference between these rates diminishes as the temperature increases; and, 4°, that for most solutions (probably for all) these rates are, at sufficiently high temperatures (30°–50°), the same as for water, i.e., the thermal expansion of solutions is the same as that of water at these temperatures. The experiments also substantiate a result formerly obtained by Professor Ewing and the author, that very weak solutions of this salt have a volume smaller than that of the amount of water which they contain.

Prof. E. Haanel gave a continuation of his paper, presented to the society last year, on blowpipe re-actions on plaster-of-paris tablets, in which he described the effect of treating copper with hydrobromic acid, and iron with hydriodic acid, and showed how to distinguish between selenium and mercury. He described also the coatings *per se*, for the above tablets, for selenium, tiemannite, arsenic, silver, alloys of bismuth, lead, and antimony with silver, galena, orpiment, realgar, mercury, tellurium, carbon, cadmium, and gold.

The same author gave a description of apparatus for distinguishing flame-coloring constituents when occurring together in an assay. The apparatus consists of a spectacle-frame, furnished for the left eye with plain colorless

glass, and, for the right eye, with four glasses, — red, green, violet, and blue. These glasses revolve on an axis, and can be brought, either separately or in any combination, before the right eye of the operator.

Prof. N. F. Dupuis showed how to develop by simple algebraical methods certain functions ordinarily developed by the aid of the calculus.

Prof. E. J. Chapman described a series of analyses of magnetic and other iron ores from samples obtained by him personally from various parts of Ontario. The geological conditions of the deposits were also briefly given.

In the geological and biological section, Dr. A. R. C. Selwyn gave an account of his observations, in 1883, on the geology of a part of the north shore of Lake Superior, in which he considered he was able to show that the great masses of columnar trap which form the summit of Thunder Cape, Pie Island, and McKay's Mountain, were not part of a 'crowning overflow,' as they have been described to be, and newer than the Keweenaw series, but that they are contemporaneous with the black slaty shales of the Animikie group, which immediately and conformably underlie them.

Professor George Lawson presented a revision of the Canadian Ranunculaceae. The author referred to his monograph of Ranunculaceae, published in 1870, to the extensive collections that had been subsequently made, and to works published upon the North-American flora, — all of which enabled a fuller and more accurate description of Canadian ranunculaceous plants to be given now than was possible when the previous paper was prepared. The greater precision given to recent observation had also enabled the geographical range of these plants to be stated more fully. The striking diversity of modification in the form, number, and arrangement of the several parts of the flower and of the fruit, in the several genera, was pointed out. The number of Canadian species is seventy-eight, and of varieties eighteen.

Dr. T. Sterry Hunt presented a second part of his essay on the Taconic question in geology, in which he endeavored to show in the first place, more fully than has yet been done, the relations of the Taconian or lower Taconic series of stratified rocks to the succeeding Cambrian, or upper Taconic, which some geologists have confounded with the Taconian. In this connection is given a critical discussion of the studies of Perry, Marcou, and others, and the opinions of Dana, as regards the Cambrian of the Appalachian region of North America. In the second place is considered

the probable equivalence of the Taconian to the Itacolumite series of Brazil, and to similar rocks elsewhere in South America and the West-Indian Islands, as well as in Hindostan and southern Europe. All of these comparative studies, it is said, tend to establish the distinctness of the Taconian as a great and widely spread series of crystalline stratified rocks, occupying a horizon between the Cambrian and the Montalban or younger gneiss series of Europe and North America.

Some deposits of titaniferous iron ore in the counties of Haliburton and Hastings, Ontario, were discussed by Prof. E. J. Chapman. After referring to the occurrence of numerous deposits of magnetic iron ore in certain zones or belts of country in the counties of Victoria, Haliburton, Peterborough, and Hastings, he described their conditions of occurrence as those of large, isolated masses or 'stocks,' — forming, in some cases, sheathed stocks, or *stockscheiders* and *skölars*, of German and Swedish miners, — as in the great iron-ore zone of Arendal, in Norway. While these stock-masses of iron ore are, for the greater part, quite free from titanium, one of vast size in the township of Glamorgan, and another equally large mass in Tudor, are shown to contain a considerable amount of titanium. Detailed descriptions of these were given, with analyses of the ore.

Prof. E. J. Chapman also read an essay on mimetism in inorganic nature. Mimetism, as recognized in organic nature, has been regarded, on the one hand, as the direct result of a protecting Providence, and, on the other, as originating in minute approaches towards the imitated object; these becoming intensified in successive generations until the imitation becomes complete, or reaches its extreme limit. In this paper, the writer attempts to show that neither hypothesis may be absolutely correct, but that the peculiarity may be due to some occult law of 'localism' by which associated forms often become impressed with mutual resemblances. In support of this view, he refers to several curious cases in which certain minerals, normally and generally of very dissimilar aspect, become closely mimetic under certain local conditions; as seen in examples of quartz and zircon, pyroxene and apatite, etc., in the phosphate deposits of the Ottawa region.

A monograph of Canadian ferns was offered to the society by Dr. T. J. W. Burgess and Prof. J. Macoun. Professor Macoun stated, that twenty years ago the total number of ferns known to occur in Canada was forty-six, while at the present time it had increased to sixty-

three. In illustrating the range of the more interesting species, he particularly noticed the occurrence of *Phegopteris calcarea* in Anticosti, where he had found it in 1882, and remarked that the same plant had recently been collected by Drs. G. M. Dawson and R. Bell in the country around and to the east of the Lake of the Woods.

Prof. L. W. Bailey, in a paper on geological contacts and ancient erosion in the Province of New Brunswick, summarized the more important and well-established lines of physical contact between the geological formations of New Brunswick as bearing upon the relative age of the latter, and the disturbances to which they have been subjected. Three well-marked breaks, separating groups of widely diverse character were recognized among pre-Cambrian strata, — the supposed equivalents of Laurentian, Huronian, and possibly Montalban horizons; a very marked one at the base of the Cambrian; and others successively between later formations to the base of the trias. The evidence of such breaks was shown to be of various character, including discordance of dip and strike, overlap, igneous extravasations, and intermediate erosion; and the bearing of the facts determined on the physical and geological history of north-eastern America was briefly discussed. The granites, which constitute so marked a feature in the geology of the Acadian provinces, were described as intrusive, and as the cause of the extensive alteration exhibited by the formations which they have invaded. The erosion which accompanied or followed upon the disturbances described was shown to have been enormous.

Mr. G. F. Matthew continued his illustrations of the fauna of the St. John group by presenting a paper on the Conocoryphidae, with notes on the Paradoxidae. The species of Conocoryphe referred to and illustrated are *C. Matthewi* Hartt (with three varieties), *C. elegans* Hartt, *C. Baileyi* Hartt (with two varieties), and a new form which the author describes as *C. Walcottii*. Critical remarks are also made upon *Paradoxides lamellatus* Hartt and *P. acadicus*.

In a description of a supposed new ammonite from the upper cretaceous rocks of Fort St. John, on the Peace River, Mr. J. F. Whiteaves considered it to be an undescribed species of *Prionocyclus*, closely allied to the type of that genus (*Ammonites Woolgari* of Sowerby), but with much more closely coiled volutions. It occurs in flattened nodules, in shales which are believed to be the equivalents of the Fort Benton group of the Upper Missouri section.

*THE MIDDLE YUKON.*¹—I.

THE extent of the Alaska military reconnaissance of 1883 was so great that I deemed it best to divide the account of it into convenient sections; and the three subdivisions, of which this is the second, have already been explained as made *wholly with reference to my own travels*. It was therefore not intended as a geographical division of this great river, although it would not be altogether unavailable even for this purpose. The Middle Yukon,

fishery or mineral, that may spring up along it.

I have spoken, in my previous article, of the comparative sizes of the Pelly and the Lewis, showing the latter to be undoubtedly the Yukon proper; and the view (fig. 1) taken looking into the mouth of the Pelly from an island at the junction of the two, and that (fig. 2) looking back up the Yukon from the site of old Selkirk, show the evident preponderance of the latter, although, in the case of the Pelly, but one of its mouths, the lower and larger

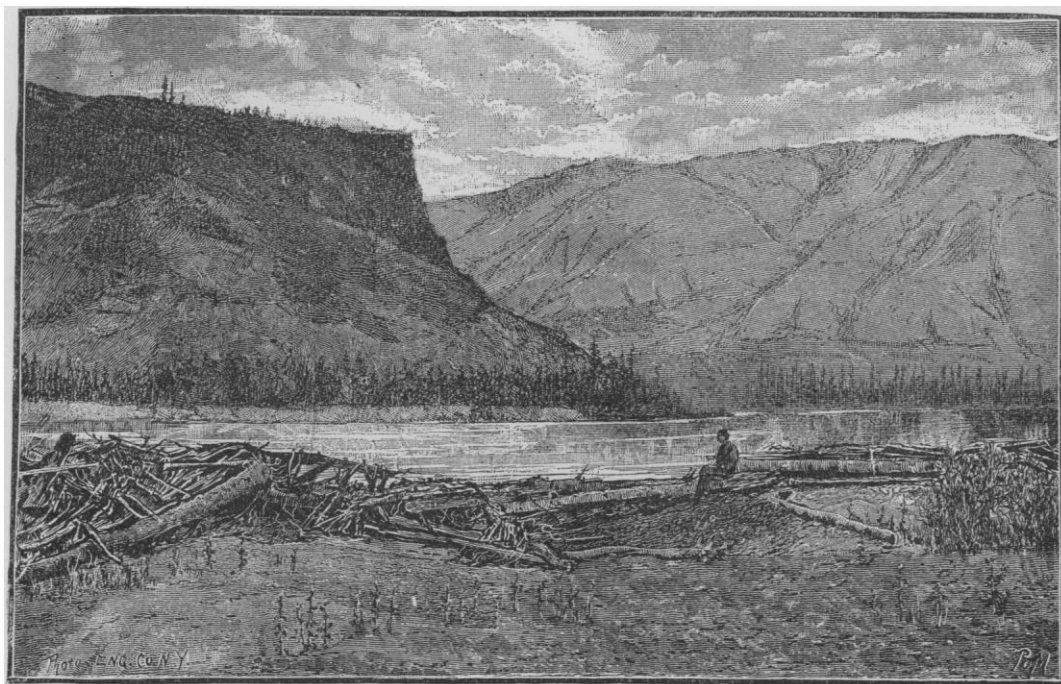


FIG. 1.—YUKON RIVER: VIEW LOOKING INTO THE MOUTH OF THE PELLY RIVER.

with reference to my expedition, extends from the site of old Fort Selkirk to old Fort Yukon, — a part of the river which we know in an approximate manner by the rough maps of the Hudson-Bay traders, who formerly trafficked along these waters, some envoys of the Western union telegraph company, and a few others. This part of the river, therefore, had been explored; and to my expedition fell the lot of being the first to give it a survey, which, though far from perfection, is the first worthy of the name, and, I believe, sufficient to answer all purposes until commerce is established on the river subservient to the industries, either

one around the island, can be seen distinctly. The perpendicular bluff of eruptive rock, distinctly columnar in many places, and with its talus reaching from half to two-thirds the way to the top, shown in the first view, extends up the Pelly on the north bank as far as it was visited, some two or three miles, and continues on down the Yukon on the same (north) bank for twelve or thirteen miles, when the encroaching mountains obliterate it. In but one place that I saw was there a break, so that one could climb from the bottom, over the *débris*, to the level plateau that extended backward from its crest; although in many places this plateau could be gained by alpine climbing

¹ See *Science*, Nos. 55, 56.

up the crevices in the body of the rock. The plateau is not very wide before the foot of the high rolling hills is gained. In fig. 1 the constant barricades of driftwood, met everywhere on the many islands of these rivers, are shown, and are much below the average in amount; the heads of the islands being often piled up with stacks ten to twenty feet high, forming more or less a protecting dam, in freshets, from the eroding power of the swift water.

An Ayan (or Iyan) Indian grave some two or three months old, on the bank of the river

From the grave itself there is erected a light pole twenty to twenty-five feet high, and having some colored cloth flaunting from its top; although in this identical grave the cloth was white, or, rather, dirty white. Not far away, always close enough to show that it is some superstitious adjunct of the grave, is another pole of about equal height; and to its top there is fastened a poorly carved figure of a fish, duck, goose, or bear, which, I think, designates the sub-clan to which the departed belonged. This pole may be, and often is, a fine

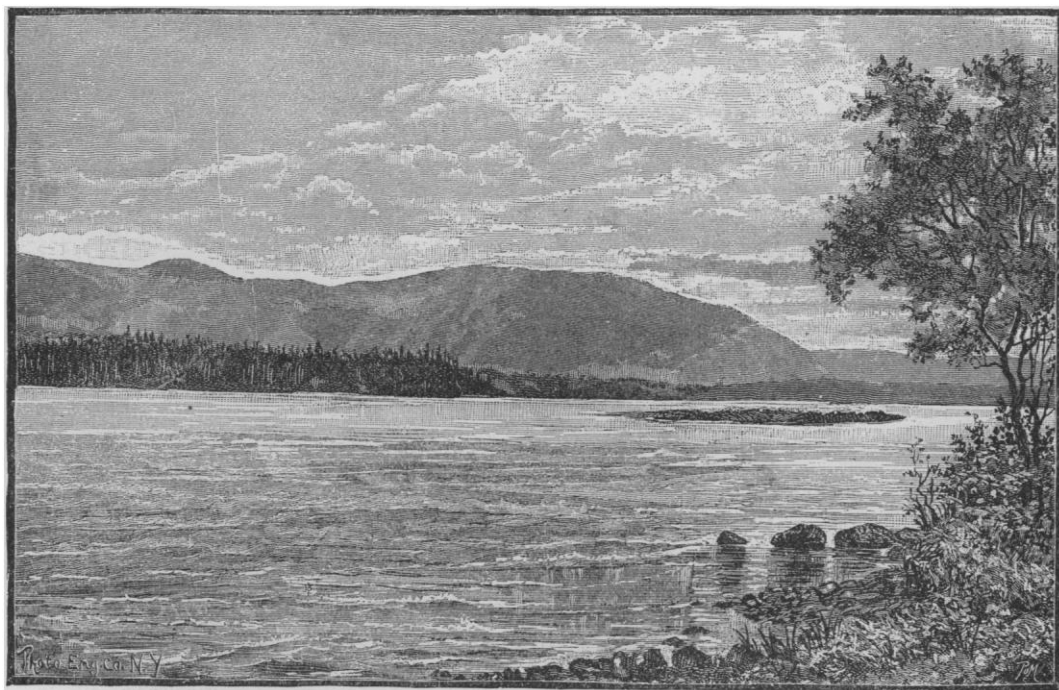


FIG. 2.—VIEW LOOKING UP THE YUKON FROM THE MOUTH OF THE PELLY.

near the site of old Fort Selkirk, was a typical one of the many we saw from here to Fort Yukon. The body is bent up, with the knees to the breast, so as to take as little space as possible, and enclosed in a very rough box of hewn boards two and three inches thick, cut out with their hand-axes, and then buried in the ground, the lid seldom being over a foot or a foot and a half below the surface. The grave-enclosure is made of roughly hewn boards, four corner-posts being prolonged, and rather neatly rounded into a design represented in fig. 3, and from which they seldom depart. It is lashed at the top by willow withes, and one or two stripings of red paint are just below this.

young tree of proper height and convenient situation, stripped of its limbs and bark. The 'totem' at the top is sometimes made as a weather-vane, or probably it is easier to secure firmly by a pin driven vertically; and it becomes a sepulchral anemoscope without their intending it for any such meteorological object. These poles may be striped with red paint, and the outside pole has one or several pieces of cloth hung from its length. The graves are always near the river-bank, and, when fresh and white, can be seen for many miles. There is no tendency whatever to group them into graveyards, beyond the fact that they are a little more numerous near their semi-permanent vil-

lages than elsewhere, the ease of interment being evidently the controlling cause of location. Leaving out the poles, there is a strong resemblance, in a rough manner, to civilized graves; and no doubt much of its form is due to the direct and indirect contacts with civilization, as my own Indians (Chilcats) told me that they formerly placed their dead on pole scaffoldings in the branches of trees, somewhat after the manner of the Sioux; and in one instance a very old and rotten scaffold in a tree was pointed out to me as having once subserved that purpose, although no surroundings confirmed the story; but these could have easily been obliterated.

We succeeded in getting a photograph (fig. 4) of a group of Ayan or Iyan Indians, with their birch-bark canoes. It was very hard work to keep them still; and, as far as fineness of features is concerned, the photograph was not perfect. Their birch-bark canoes are the best on any part of the river in lightness, compactness, and neatness of build and design. The paddle, well shown in outline in the hands of one of the group, is of a cross-section shown in fig. 5, the ridge or rib, *r*, being always held to the rear in using it. In addition to the paddle, there are two light poles for each canoe, about as long as the paddle, and as heavy as its handle; and these are used in

ascending the river by keeping near the shore, and using one on each side of the canoe, poling against the bottom. So swift is this great river in these parts, that they use no other method in ascending it, except for very short distances. In descending, the current is the main motive power, especially for long journeys, and the

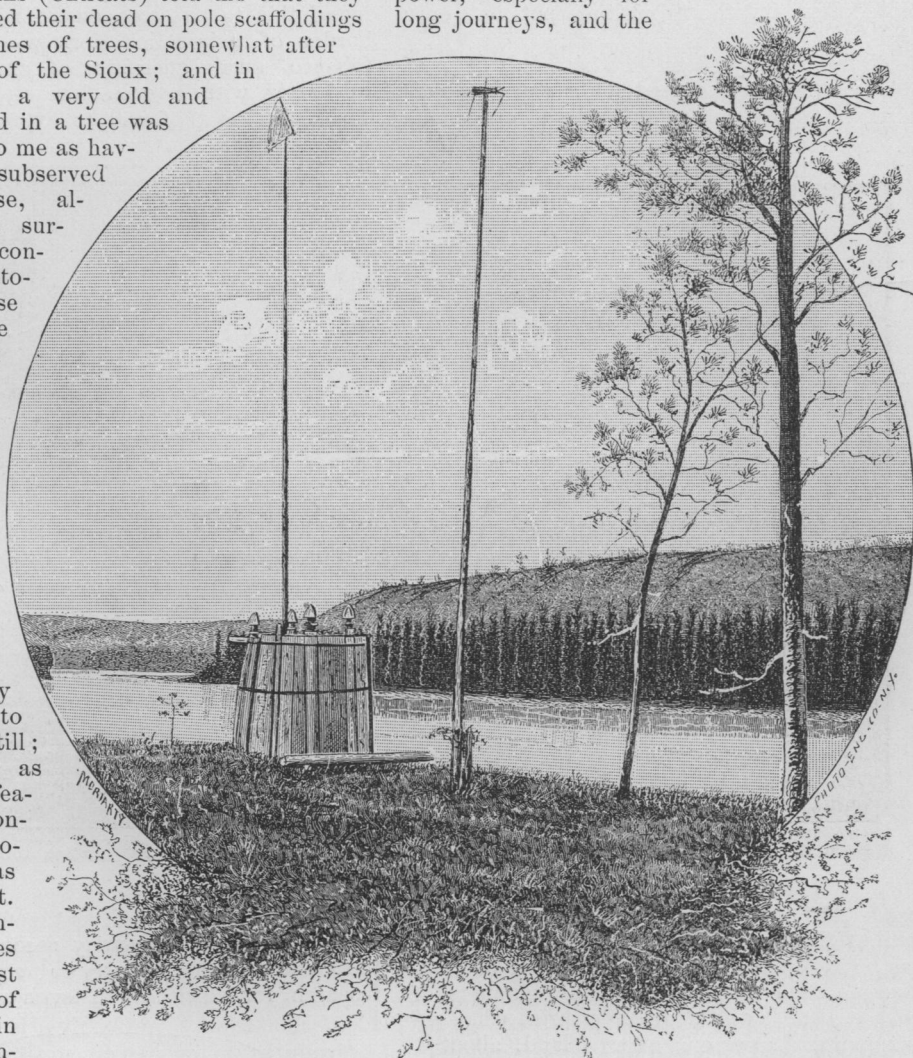


FIG. 3.—LOOKING ACROSS THE YUKON. THE BLUFFS ARE OBSCURED BY THE HIGH SPRUCE-TREES ON THE ISLAND, THE HILLS BEYOND SHOWING ABOVE.

paddle is only leisurely used to keep them in the swiftest part of the stream. When they desire, however, they can go at a gait that few canoeists in the world, savage or civilized, could equal.

A couple of species of fish were caught near the site of Selkirk, — the grayling being the

same kind that was caught in such immense numbers near Miles' Rapids, and observed in varying numbers from Perthes Point, on Lake Bove, to the mouth of White River, averaging a trifle over a pound in weight; and a trout-like salmon, caught sparingly from Lake Nares to White River, occasionally with a fly, but more often on the trout-lines put out over night.

We got away from Selkirk, July 15, at 1.15 P.M., having waited for a meridian culmination of the sun for an observation for lati-

bulky raft was swung in as if it had been a canoe.

From previous explorers on the river, I had been deluded into the idea that useful articles — as knives, saws, and files — were the best for trading-purposes, the purchase of native work, and payment of services; but I soon found this to be erroneous, for the constant burden of their solicitations was for tea and tobacco, small quantities of which they get by barter with intermediate riparian tribes. These desires I found to extend the whole



FIG. 4.—AYAN INDIANS AND THEIR BIRCH-BARK CANOES.

tude. Although we had understood from the Indians that had visited us, that their village was but a few miles below Selkirk, we had become so used to weak, straggling numbers of natives, that it was a great surprise when we rounded the lower end of an island, about 4 P.M., to see from a hundred and seventy-five to two hundred Indians on the south bank of the river, ready to receive us; our coming having been heralded, evidently, by advance couriers, and all of them apparently half frantic with excitement for fear that we would drift past without visiting them. A line was thrown ashore, and every man, woman, and child got hold of it, and the great



FIG. 5.

length of the river; and, as the former article is light, I would especially recommend it to those entering that country to pursue scientific research, for which there is such a grand field.

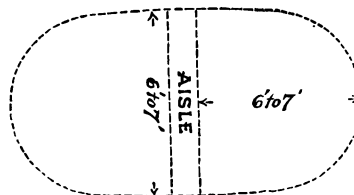


FIG. 6.

These Indians call themselves the *Ā-yans*, with an occasional leaning of the pronuncia-

tion towards I-yan; and this village contained the majority of the tribe. The village was called Kah-tun^g, also Tah-kon^g or Tahk-ong (*tahk* seeming to be a root in the language of this country: *vide* Tahk-heesh, Tahk-heen-a, Tahk-o, etc.). It was of a semi-permanent character; the huts made of spruce brush, over which there was an occasional piece of cloth or canvas, or a caribou or moose skin. These brush houses were squalid affairs, and especially so compared with the bright, intelligent look of the makers, and with some of their other handicraft, as their canoes and wearing apparel. One could hardly stand up in the houses: they were generally double, facing each other, with a narrow aisle between, each one containing a single family, and about the area of a common government A tent. Fig. 6 gives a ground plan of a double brush house. The village of Kah-tung contained about twenty of these houses, huddled near the river-bank, and altogether was the largest Indian village we saw on the whole length of the Yukon River. There was a most decided Hebrew or Jewish cast of countenance among many of the Ayans; greater, in fact, than I have ever seen among any savages, and so conspicuous as to make it a subject of constant remark.

Their household implements were of the most primitive type,—such as spoons of the horn of the mountain sheep, very similar to those of the T'linkits, but in no wise so well carved; and a few buckets, pans, and trays of birchbark, ingeniously constructed of one piece so as not to leak, and neatly sewed with long withes of trailing roots.

Just after landing the raft, the crowd that

lined the narrow beach commenced singing and dancing,—the men on the (their) left, and the women on the right. The song was low and monotonous, but not unmusical,—characteristic of savage music. Their hands were placed on their hips, and they swayed laterally to the rude tune; while the medicine-men went through the most hideous gymnastics possible. A photograph was attempted of this group; but the weather was so unfavorable, the amateur

apparatus so incomplete, and the favorable opportunity so hard to seize, that it was a complete failure. After tea and tobacco, which we could spare only in small quantities, fish-hooks seemed to be their favorite demand; and the very few articles they had to spare, mostly spoons and birch cups and buckets, were eagerly exchanged. Another article freely brought us was the pair of small bone gambling-tools, so characteristic of the whole north-west country. Fig. 8 is from a pair in my possession, and about true



FIG. 7. — KON-ITL, CHIEF OF THE AYANS.

size. They are always used in pairs in gambling, one being distinguished from the other by one or two bands of black engraved around it. The game has been so often described that I will not repeat it. Their present village was evidently but a semi-permanent one, used only in summer during the time that salmon were running by; the pink sides of this fish, as they were hanging around, split open, forming a not unartistic contrast with the dark-green spruce boughs of the houses, especially if the nose was held between the two fingers. The women, instead of carrying the babes on their backs with their face to the front, turn them around so as to be back to back, and carry them so low that they fit somewhat in the

'hollow of the back.' The moose-arrows used by this tribe have a double barb forward, as in the common arrow, while one side is prolonged for two or three inches into a series of barbs; and these have the effect of working inward with the motion of the animal, if it be only wounded. In hunting

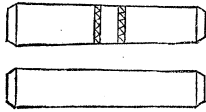


FIG. 8.

moose, while these animals are crossing the streams or lakes, so one of my interpreters said who had traded among them many times, they do not hesitate to jump on the animal's back in the river, leaving the canoe to look after itself, and despatch the brute with a hand-knife. Of course, a companion is needed in a canoe to get the carcass ashore, and secure the captor's canoe.

Small black flies were now commencing to be annoyingly numerous, and were added to the plague of mosquitoes, that never left us. The bars, that were some protection from the latter, were of no use against the former. Nearly directly opposite the village the perpendicular bluffs shown in the first illustration ceased; and from here on, the hills on both sides of the river commenced to grow higher and even mountainous in character. About thirty-four miles beyond the Selkirk a very conspicuous mountain stream came in from the south, which I named after Prof. A. R. C. Selwyn of Ottawa. The river was still very full of islands, however, many of which are covered with tall spruce, and look very picturesque in the almost cañon-like river-bottom, the steep hillsides being nearly barren of such heavy timber. At this time our attention was called to a singular phenomenon, while riding on the raft, and especially noticeable on quiet, sunny days. I refer to a very conspicuous crackling sound, which was not unlike that of fire running through cedar-brush, and which the men attributed to a pelting on the raft from underneath by a shower of pebbles brought up by the swift current, and which would have been a good-enough theory as far as the sound was concerned; but measurements in these places invariably revealed no bottom for a sixteen-foot sounding-pole, and, when going over shallower and swifter water with pebbly bottoms, the crackling ceased. It being always in deep water of a boiling nature, figuratively speaking, I attempted to account for it in a manner explained by fig. 9. The raft *x*, drifting with the arrow, passes from a shallow to a deep stretch of water. The Yukon is very swift (we drifted that day, July 16, forty-seven and a half

geographical miles in eleven hours and fifty minutes), and the pebbles, carried forward over the shallow part, and reaching *a*, are carried forward and literally *dropped* on a gravel-bank at some point forward, as *b*; and, water being a good conductor of sound, a person on a floating craft, during quiet days, would distinctly hear this falling, when it would not be heard if they were simply rolling along the bottom in swifter water. The suddenness with which the crackling commenced, and the gradual manner in which it slowly died out, also help this idea. A series of soundings before and after these sounds would have settled this theory; but it occurred so seldom (once or twice, or possibly three times, a day in this part of the river), that it was impossible to foretell it so as to do so, unless one kept sounding all day. It was noticed in a much less degree on the lower river, but probably would not have been observed if previous experience, of a

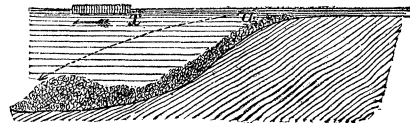


FIG. 9.

more marked character, had not brought it before us. Some twenty or twenty-five miles below the Ayan town, we saw a large black bear about halfway up the hillsides of three thousand feet altitude, and, not far from this, three mountain goats near the summit. A number of Ayan graves were seen on the banks of the river, resembling, in general, the one photographed at Selkirk.

(To be continued.)

DEVELOPMENT OF SIPUNCULUS NUDUS.

DR. HATSCHKE adds to the list of his valuable embryological memoirs a very elaborate and interesting paper on the development of the gephyrean, *Sipunculus nudus*.

The cleavage is unequal, and results in the formation of about twenty-four cells, of which *seven* form the endoderm, and *seventeen* the ectoderm. The endodermal cells are arranged in three pairs on the lower pole of the egg, with an odd cell at the hind end. This stage corresponds to a blastula with a single wall of cells enclosing a cleavage-cavity. The odd endodermal cell is the mother-cell of the mesoderm, and is called the 'primary mesoderm cell' in the following stages. An invaginate gastrula is formed; and during this stage the primary mesoderm cell divides, thus giving a pair of mesoblasts at the

posterior border of the blastopore. During the closure of the blastopore, which begins at the hind border and progresses towards the anterior border, the pair of mesoderm cells pass inward, taking up a position between the ectoderm and the endoderm. The blastopore closes completely; but the last (anterior) portion to close corresponds in position with the inner opening of the oesophagus, which is an ectodermal invagination.

Almost as soon as the gastrulation begins, the ectoderm becomes clothed with cilia, which pass through the pores of the zona radiata, and are thus in a position to set the embryo, together with its envelope, in motion.

One of the most interesting features of the development is the formation of an embryonic envelope at the expense of the ectoderm, only a portion of the ectoderm entering into the embryo proper. The ectodermal parts of the embryo arise from two separate portions of the ectoderm; viz., (1) a group of cells at the animal pole, and (2) the ectoderm cells of the blastoporic rim. The former, called the 'head-plate,' bears a long tuft of cilia, and later gives rise to the supra-oesophageal ganglion: the latter, called the 'trunk-plate,' forms the body, including the oral and post-oral region of the head. The rest of the ectoderm is employed in forming the embryonic envelope, or serosa, which arises as a fold around the trunk-plate during the closing of the blastopore. The fold gradually closes up over the plate, and thus brings about conditions similar to those seen in insects. The inner layer of the fold, however, does not form an amnion, but is gradually absorbed in the trunk-plate. The head-plate stretches a short distance under the serosa, but is not completely enveloped. During the closure of the blastopore, the mesoblastic bands begin to form as two rows of cells budded off from the two mesoblasts, henceforth called 'pole cells of the mesoderm.'

Very early in the gastrula stage a circular groove forms around the head-plate, thus forming a boundary-line between the plate and the serosa. This groove is formed by the retreating of the protoplasm of the cells in this region from the egg-membrane. In the same manner is formed a dorsal canal, leading out of the ring-canal, and stretching along the dorsal side, terminating in the free edge of the fold around the trunk-plate. As this fold closes up over the trunk-plate, and its inner layer is gradually taken up by the plate, there is formed a cavity between the plate and the outer layer of the fold, or the serosa. The ring-canal, the dorsal canal, and this cavity, form together a system of amniotic cavities.

The main axis of the gastrula, which joins the animal with the vegetative pole, does not coincide with the long axis of the larva. The animal pole of the gastrula axis corresponds to the anterior pole of the larva, but the vegetative pole is carried forward on the ventral side to a point about midway between the mouth and the hind end; and this bending of the gastrula axis brings the 'pole cells of the mesoderm' exactly opposite the animal pole, at the posterior extremity of the larva. This change in axial relations

is brought about by the growth of the trunk-petal. That part of this plate which lies behind the pole cells shifts its position to the dorsal side, and thus pushes the pole cells forward. The extension of the trunk-plate on the dorsal side is soon followed by expansion on the ventral side. This growth of the trunk-plate not only changes the axial relations, but also brings it into continuity with the head-plate, thus effecting a union of the two hitherto separate ectodermal portions of the embryo.

The fully-formed embryo has a post-oral, ciliated band in the equatorial zone, close behind the mouth, and is attached to the egg-membrane and the serosa at the cephalic end. The escape of the embryo from the egg-membrane and the serosa requires several hours, and is attended with changes of the external form, especially in the region of the head-plate, that are not easily described without the aid of figures. It is the hind end of the body that first breaks through the envelopes. The rupture is made at the pole opposite the head-plate, and gradually increases in size as the body elongates, and forces its way outward. While the body is thus liberated, the head-plate is pulled away from the serosa and the membrane, but remains fastened at several points by string-like elongations of its substance. The serosa and membrane now form a sort of helmet, which the embryo bears about for some hours, and then throws off.

Only two days and a half are consumed in the embryonic development, while the larval period, upon which the embryo now enters, and during which it leads a pelagic life, continues for an entire month. During this period the larva grows rapidly, without undergoing any important changes in form or in inner organization, except the formation of the ventral nerve-cord and the histological differentiation of the muscles.

At the end of this period the larva is changed by a quick metamorphosis into the adult form. The metamorphosis is characterized by the loss of the ciliated band, the degeneration of the accessory organs of the oesophagus, the narrowing of the stomach, and the acquisition of the dorsal vessel. These changes seem to be correlated with the abandonment of a free pelagic life. The rapid growth does not take place uniformly in all parts, but most energetically at the hind end of the body. This 'polarity of growth' is characteristic of metameric and many non-metameric animals.

At the beginning of the larval period no part of the nerve system is fully differentiated. During this period the ventral nerve-cord arises, not by the concrescence of symmetrical halves, but as a single median thickening of the ectoderm. The development and separation of this cord from the epithelium progresses from the anterior end of the body backward. The oesophageal commissures form later than the ventral cord; and their development progresses in the opposite direction, beginning at the anterior end of the cord, and advancing towards the head-plate. Last of all arises the supra-oesophageal ganglion from the deeper cells of the head-plate, which bears the two pigment eye-spots. The com-

missures begin as a single string, which forks anteriorly to form the oesophageal ring.

The muscular sack consists of an outer ring-muscle layer and an inner layer of longitudinal fibres.

The blood-vessel system belongs to the latest formations. The dorsal vessel has, for the most part, an asymmetrical position, beginning on the dorsal side of the oesophagus, and running along the left side of the alimentary canal, to end in the region of the dorsally placed anus.

During the metamorphosis the nephridial organs undergo a rapid transformation; the cilia and ciliated funnels disappearing, and the looped portions being reduced to vesicles.

In conclusion, Hatschek discusses the phylogenetic relationship of *Sipunculus nudus* with *Phascolosoma* and the annelids. *Sipunculus* agrees with the annelids in the formation of the germ-lamellae and the gastrula, in the origin of the mesoderm from two primary mesoblasts, in the splitting of the mesoblastic bands into a visceral and a parietal leaf, in the closure of the blastopore, and in the formation of the oesophagus at the point which marks the last portion of the blastopore to close, but differs in having an embryonic envelope, and especially in the absence of any trace of metamerism.

The larva has some characters in common with the Trochophora, which plays so important a rôle in the worms and mollusks; but these are such as are generally preserved, even after the Trochophora stage is passed. The points of agreement are, an ectoblastic stomodaeum and proctodaeum and entoblastic mesenteron, and the head-plate (*scheitelplatte*): the points of difference are, absence of a pre-oral ciliated band, weak development of the head in comparison with the body, the possession of a secondary body-cavity (*coelom*), and the absence of provisional head-kidneys and head-muscles.

The absence of any sign of metamerism forms the most important objection to the derivation of the Sipunculidae from the annelids.

Hatschek concludes that the class Gephyrea must be broken up, the Echiuridea forming a sub-order of the chaetopods, and the Sipunculidae allowed to stand in the place hitherto occupied by the Gephyrea, i.e., next to the annelid class. C. O. WHITMAN.

THE MEETING OF THE AMERICAN MEDICAL ASSOCIATION IN WASHINGTON.

THE thirty-fifth annual session of the American medical association was held in Washington, D.C., early in May, beginning on the 6th, and closing on the morning of the 9th.

The mornings were devoted to the transaction of routine business by the general association; and the afternoons, to the meetings of the different sections, the reading of papers, and the discussions resulting therefrom.

The attendance of delegates was very large, the number registered exceeding thirteen hundred. The

interest in the exercises was great, and the amount of work done may be favorably compared with that of any previous meeting of the association. A detailed criticism of the individual papers presented, or of the work done in preparation for them, would be out of place and impossible. The several authors will have full justice in the columns of the *Journal* of the association. A review of the meeting as a whole may be of interest, however, together with a consideration of some of the more important incidents which may bear fruit that will affect the community at large.

The first thing that will bear criticism is the enormous amount of material that was placed upon the programme. In the section for the 'Practice of medicine,' etc., besides the leading paper of the first afternoon, there were eight others ready for presentation on the same day. Inasmuch as the session did not begin until 2.30 P.M., there was, of course, no possibility of doing justice to all this work. The possibility of *injustice*, however, was very great, not only in the shortening of the discussions, which should be the most important part of the work, and which should form the channel for the presentation of new or original work by those taking part, but also in the non-presentation of some of the papers at all. This latter point is to be deplored, for the reason that any one who has once put himself to the trouble of preparation, only to suffer disappointment, is not likely to repeat the experiment in the future. Thus, the society may be deprived of the pleasure and profit to be derived from listening to men who may have results of importance to communicate.

Another thing that should be put a stop to in the future, and this once for all, is the action of some of those who took part in the discussions, in reading from manuscript which could not, by the wildest stretch of the imagination, be considered as having been 'notes,' and which in many cases bore only the faintest relation to the subject in hand. An attempt in this way to present a paper where it had no business to be, was fortunately defeated on the afternoon of the third day of the meeting; but this was the only instance of a protest upon the spot that we know of. The invitation to take part in a discussion should be declined, if the recipient does not feel himself sufficiently well equipped to speak in any but this cut and dried fashion. The idea of a discussion, it should be needless to state, is to call out the individual opinions of participants, and not to afford an opportunity for the introduction of papers not on the programme.

A resolution urging the various medical schools of the country to adopt a higher standard for graduation was passed, and should be of interest to all who are concerned about the medical attendance upon their families. If this action should bear fruit, it alone would be enough for the association to have accomplished at one meeting. The loose manner in which so many of the schools of the country grant their diplomas, and the ill effects of such action, can only be fully appreciated by the medical profession itself. Every member of society, however, is, or

should be, interested in so vital a question. None of us know, fortunately perhaps, how, or at what time, the injury may come to us through the ignorance of some of the new-fledged graduates of many of our schools. It should be said again and again, therefore, that the diploma-giving power of many of the medical schools of this country should be in some way regulated according to the thoroughness of their course for a degree.

The movement to induce the International medical congress to hold its meeting of 1887 in this country should meet with the success it deserves. The possible benefits to be derived from this are very great and far-reaching. The presence of so many of the *savants* of the medical world might be of benefit in showing some of us what we do not know. The bringing so near home, too, the results of the scientific labors pursued so much farther abroad than they are with us, might serve to open the eyes of more of our rich men, and lead to the establishment of the scientific laboratories that we need so much.

A committee was appointed to attempt to induce congress to provide for the systematic investigation of infectious diseases in this country,—a forlorn hope truly, so long as our legislators are as they are; but at the same time the slight possibility of success should not hinder the attempt from being made. Those who are interested in scientific investigation of this nature, however, do not look for the establishment of any governmental institution until the average member of that government has lost his desire for a sure return in dollars and cents to an investment.

The lack of scientific work in its purest form was well shown in the discussion upon 'tuberculosis' which took place on the last day of the session. This disease is the centre of scientific medical interest just now, and has been ever since the announcement by Koch of his discovery that its cause could be found in a micro-organism. The evidence brought forward since that time has been strongly in support of the truth of his assertions. The gentleman who opened the discussion did not agree with Koch's conclusions on the ground of personal observations; the basis of his conclusions being reserved, however, for future publication. By far the larger number of those participating in the discussion took sides with Koch; and yet, eminent as most of them were, there was hardly an observation made that was based upon the result of original personal investigation. For this reason the discussion was satisfactory only as bringing out personal opinion as based upon literary, and not upon laboratory work. What is needed in this country, above and beyond any thing else in the medical way, is a corps of scientific investigators devoted to their work, and thoroughly well equipped by temperament and training. Before this comes, however, must be the establishment of thoroughly endowed and completely independent centres where their work can be performed.

This gathering in Washington should teach the impropriety of asking for papers that are not likely to be presented to the meeting, the necessity for a little

more control over the methods of discussion, and the need for a better representation of the men especially interested in scientific research, if there be any who have not yet made their appearance.

The needs especially emphasized are the want of a higher standard of medical education throughout the country, and particularly the lack of facilities for scientific research in the newer branches of medicine.

From a professional point of view, the meeting was a successful one in most respects; the papers that were presented showed care in preparation, and, as a rule, a thorough practical knowledge of the subjects treated. As in all such cases, however, the especial benefit to be derived was found in the opportunities presented for personal contact and conversation between men separated by long distances from one another.

HOW EGG-COCOONS ARE MADE BY A *LYCOSA*.

At the meeting of the Academy of natural sciences of Philadelphia, May 13, Rev. Dr. H. C. McCook stated, that, while walking in the suburbs of Philadelphia lately, he had found under a stone a female *Lycosa*, probably *L. riparia* Hentz, which he placed in a jar partly filled with dry earth. For two days the spider remained on the surface of the soil, nearly inactive. The earth was then moistened, whereupon she immediately began to dig, continuing until she had made a cavity about one inch in depth. The top was then carefully covered over with a tolerably closely woven sheet of white spinning-work, so that the spider was entirely shut in. This cavity was fortunately made against the glass side of the jar, and the movements of the inmate were thus exposed to view. Shortly after the cave was covered, the spider was seen working upon a circular cushion of beautiful white silk about three-fourths of an inch in diameter, which was spun upward in a nearly perpendicular position against the earthen wall of the cave. The cushion looked so much like the cocoon of the common tube-weaver, *Agalena naevia*, and the whole operations of the lycosid were so like those of that species when cocooning, that it was momentarily supposed that a mistake in determination had been made. After the lapse of half an hour, it was found that the spider had oviposited against the central part of the cushion, and was then engaged in enclosing the hemispherical egg-mass with a silken envelope. The mode of spinning was as follows: the feet clasped the circumference of the cushion, and the body of the animal was slowly revolved; the abdomen, now greatly reduced in size by the extrusion of the eggs, was lifted up, thus drawing short loops of silk from the expanded spinnerets, which, when the abdomen was dropped again, contracted, and left a flossy curl of silk at the point of attachment. The abdomen was also swayed backward and forward, the filaments from the spinnerets following the motion as the spider turned, and thus an even thickness of silk was laid upon the eggs. The

same behavior marked the spinning of the cushion, in the middle of which the eggs had been deposited. The ideas of the observer as to the cocooning habits of *Lycosa* were very much confused by an observation so opposed to the universal experience. Upon resuming the study after the lapse of an hour and a half, he was once more assured of being right by the sight of a round silken ball dangling from the apex of the spider's abdomen, held fast by a short thread to the spinnerets. The cushion, however, had disappeared. The mystery, as it had seemed, was solved: the lycosid, after having placed her eggs in the centre of the silken cushion, and covered them over, had gathered up the edges, and so united and rolled them as to make the normal globular cocoon of her genus, which she at once tucked under her abdomen in the usual way. This was a most interesting observation, which Dr. McCook believed had not before been made. The manner of fabrication of the cocoon of *Lycosa* had been heretofore unknown to him, and, by reason of her subterranean habit, the opportunity to observe it was of rare occurrence. He had often wondered how the round egg-ball was put together, and the mechanical ingenuity and simplicity of the method were now apparent. The period consumed in the whole act of cocooning was less than four hours: the act of ovipositing took less than half an hour. Shortly after the egg-sac was finished, the mother cut her way out of the silken cover. She had evidently thus secluded herself for the purpose of spinning her cocoon.

Dr. McCook also alluded to another interesting fact in the life-history of the *Lycosa*, which had been brought to his attention by Mr. Alan Gentry. A slab of ice having been cut from the frozen surface of a pond about eight or ten feet from the bank, several spiders were observed running about in the water. They were passing underneath the surface, between certain water-plants. It is remarkable to find these creatures thus living in full health and activity, in midwinter, within the waters of a frozen pond, and so far from the bank, in which the burrows of their congeners are commonly found. It has been believed heretofore, and doubtless it is generally true, that the lycosids winter in deep burrows in the ground, sealed up tightly to maintain a higher temperature.

CALDERWOOD'S MIND AND BRAIN.

The relations of mind and brain. By HENRY CALDERWOOD, LL.D., professor of moral philosophy, University of Edinburgh. Second edition. London, Macmillan & Co., 1884. 20 + 527 p. 8°.

It is a striking comment upon the complete change of stand-point assumed by psychologists, to find an eminent Scotch metaphysician giving up one-half of a work upon the mind to the consideration of the anatomy and physiology of the brain. That he is in accord with the prevailing tone of thought, both among

general readers and among special students, is proved by the fact that a second edition of this work has been demanded.

Dr. Calderwood presents the results of recent investigation in two sciences, — physiology and psychology, both animal and human; and his work is in the main successful, because the author possesses the power of impartial judgment, which enables him to admit all the evidence before pronouncing a decision, and also the power of making a clear statement of both scientific facts and philosophical problems. Those who desire to ascertain the kind of work which is being done in the comparatively new department of physiological psychology will find the book of great service. The subject "has to do with the foundation questions for all mental philosophy; for current theories concerning the origin and development of life on the earth, and speculation affecting the order and government of the universe as a whole, have more or less bearing upon it" (p. 9).

In the earlier chapters, the author succeeds in giving a clear and interesting account of a dry and complex subject, — the comparative anatomy of the nervous system. He then proceeds to the physiology of its various parts, devoting particular attention to the question of the localization of functions in the brain. The existence of definite areas upon the surface of the brain, whose irritation produces motion of the limbs, or sensations, according to the area irritated, and whose destruction produces a loss of the power of motion or sensation in the corresponding organs, is no longer a matter of question. By confining his attention to the researches of Ferrier, and by omitting the equally important and more recent conclusions of Munk of Berlin, Dr. Calderwood has failed to give a complete review of the physiological facts at present known. Had he ascertained the position reached by pathologists from the study of cases of limited centres of disease in the brain of man, he would have admitted more freely the existence of localizable areas in the human cerebrum. In his chapter on brain-disorders, he omits to mention a large class of cases which have a bearing on this subject; viz., cases in which a small destruction of brain-substance has been accompanied by a loss of one function, the function affected depending upon the situation of the disease. In this connection, Dr. Calderwood repeats a statement of Sir Charles Bell, that "whole masses of brain in man may be destroyed without any immediate influence upon mind" (p. 51). As a matter of fact, careful examination of such cases will rarely fail to demonstrate the pres-

ence of mental symptoms, which may be summarized as a loss of self-control and consequent change of character. In spite of these defects, the author's statement of the subject of localization is the best that can be found outside of physiological text-books.

In an interesting chapter upon the comparison of structure and functions of the brains of various animals, the conclusion is reached that mental activity is not proportionate to complexity of brain-development. He says, "The state of the case is this: the dog, with a brain less elaborate in its convolutions, shows a higher degree of intelligence; the horse, with a more ample and complicated series of foldings in the convolutions, shows less intelligence. Advance in intelligence, and advance in complexity of brain-structure, do not keep pace with each other" (p. 148). He claims, on the other hand, that "large development of brain, apart from marked development of sensory apparatus, is prominently connected with the functions of the motor side of the nerve system" (p. 259). These conclusions serve to introduce his theory of animal intelligence, which is the new feature of this edition.

Animal intelligence, according to Dr. Calderwood, is simply 'sensori-motor activity.' It is reflex and automatic action. It is the same in kind, from the simple act of the mollusk in drawing in and expelling currents of water, up to many of the most highly complex and co-ordinated acts of man. The nerve system, in all cases, may be resolved into a typical form, consisting of two sets of fibres (one sensory, one motor) meeting in a central organ, which may be a single cell of the spinal cord, or a complex assemblage of bodies crowned by the cerebrum. Motion starting at the periphery, carried along the sensory nerve, is communicated to the nerve-centre, there modified, and thence transmitted along the motor fibres, outward to the muscle, where it produces motion. This is sensori-motor activity. It is discriminative and purposive. But from these characteristics it is a mistake to argue intelligence. "Purposive action nowhere necessarily involves intelligence" (p. 205). The intelligence of animals, thus viewed, is the antithesis of intelligence in man, which has other characteristics. The degree of intelligence in animals depends upon the degree of perfection in their sensory organs. The great intelligence of the ant is due to its fine organ of touch, in the antennae; that of the chick, to its power of vision; that of the dog, to its keen sense of smell, combined with its moderately developed sense of sight, etc. He concludes, that, in the whole range of

animal life, power of discrimination is largely determined by the range of sensibility belonging to external organs of sense. "The so-called intelligence of animals is nothing more than the purposive action of mechanical apparatus." Their memory is mechanical, and does not imply true intelligence, as Huxley has long taught. The degree of intelligence in animals is due less to the development of inherent powers by natural selection than to their training by man. "The intelligence of the dog is a distinct product of thousands of years of human training. . . . Accordingly the intelligence of the dog is withdrawn from available evidence as to natural evolution of intelligence in the world. . . . This is not intended as a denial of a law of evolution operating within living organism, but it materially affects the structure of the theory of evolution by natural selection, taken as a whole" (pp. 250, 251). "Evolution of organism and of intelligence do not so harmonize that progress in the one can be a pure index to progress in the other" (p. 261). From the study of animal actions, Dr. Calderwood concludes that no animal interprets its own sensory experience, or develops its own nature, or improves that of its own species, by reflective exercise. "All that is concerned with higher intelligence, whose natural function it is to seek the interpretation of sensory impressions, and to govern activity on principles of conduct superior to the impulses of sensory apparatus, lies quite beyond the region of investigation hitherto explored. . . . Mind does not find a place within the area of nerve apparatus" (p. 288). Mind is revealed to us by consciousness. "Consciousness assures us of the existence of non-organic elements connected with sensory experience: viz., 1°, interpretation of impressions made on the sensory apparatus; 2°, inference by comparison of past experience with present; 3°, synthesis of knowledge by use of forms and materials belonging to mind itself. . . . These indicate the presence in human life of an intelligent nature distinct from organism, as it is different from that which we designate 'animal intelligence'" (p. 308).

This view of the subject deserves consideration, however much we may differ from the author. It is evident that Dr. Calderwood believes that there is no relation between brain and mind as he defines the latter. But being unable to ignore the resemblance between the intelligent action of animals and of man, or to pass by the many forms of interaction of mind and body as described in a subsequent

chapter, he adopts the automatic theory for the explanation of animal intelligence, and carries it farther into the range of human action than any psychologist has hitherto ventured to do.

His theory of the dependence of mental activity upon the degree of perfection of sensory organs in animals is ingenious, but his own statement of the typical form and function of the sensori-motor system is opposed to it. That system is a double one, and no amount of development in one half can compensate for a lack of development in the other half. However fine the structure of a sensory organ, it is useless, unless a corresponding development has occurred in its governing centre and executive motor apparatus. An example in point is the olfactory apparatus in man, which is a beautiful piece of mechanism, without a correspondingly complex central organ, — a survival of a formerly valuable sense, at present almost useless. Nor can Dr. Calderwood's conclusion that the complexity of brain structure is proportionate to muscular development be admitted in a causal connection. There is, doubtless, a parallelism. But the one settled fact of brain physiology is, that, through the entire range of vertebrate animals, but two convolutions of the brain are the seat of motor functions. The other convolutions have nothing to do with governing muscular action; and it is inconceivable that they have developed simply to keep pace with the two motor convolutions which form but a small fraction of the entire brain. From a comparison of the habits of the dog and the horse, and of the dog and the ape, Dr. Calderwood concludes that the dog is a more intelligent animal than the others. He finds the dog's brain a comparatively simple structure, and then states his wide generalization that complexity of structure has no relation to intelligence. But a few pages farther on he takes care to show that the dog's intelligence is due to a thousand years of man's training. Is it not possible that the horse and ape, under the same conditions, might have made even a greater progress than the dog has made? And as long as this possibility remains, does it not invalidate the generalization?

It is impossible, in a limited space, to follow the author in all his arguments. It is only necessary to call the attention of readers to the fact that Dr. Calderwood's explanations of the facts he so clearly states, are not the only ones to be considered. The chief defect in the entire discussion of animal intelligence is the lack of discrimination between various grades

of reflex action. There are lower and higher reflexes, simple and complex reflexes, according as the reflex centre excited lies farther from or nearer to the cortex of the brain. Each higher reflex centre not only possesses a power of its own, but also exerts an inhibitory action upon those below it. It is this inhibitory action which makes reflex action purposive. A complex reflex centre receives numerous sensory impulses, compares them, and selects the proper response. If we admit that the cortex can act automatically, we must admit, that, in such automatic action there, the centres receive, group, distinguish, and co-ordinate many various impulses arriving in them from different organs at once, and respond by sending out a complex and co-ordinated impulse to the muscles. An example is the balancing of the somnambulist as he walks a narrow bridge. This is very different from the simpler reflex which draws back a finger from the flame. But when this complex reflex is analyzed, it is found to contain many of the elements which Dr. Calderwood would limit to conscious intelligence of man. In the anecdotes given on pp. 236 and 243 we have examples of a 'sensori-motor activity,' which was certainly the result of the animal's interpreting its own former sensory experience, and comparing past with present acts with a view to the regulation of conduct. In a word, we have in these animals' actions a proof of consciousness and intelligence in the strict sense in which the author applies these terms. 'Mind' must be given a place within the area of nerve apparatus. It may be admitted that we have no proof of the existence of consciousness in others; but, if we argue consciousness from action, we must include the actions of animals as well as of our friends. We are reduced to one of two alternatives: either much that Dr. Calderwood advances as evidence of mind in man is really evidence of a more complex sensori-motor activity, or much that he explains away in animals is true intelligence. There is such a continuity of development, both in organism and in intelligence, that any attempt to draw a boundary-line between sensori-motor activity and intelligence at once raises objections on both sides, — a conclusive proof that we are not yet able to draw the boundary.

We do not care to follow the author through the more psychological part of his work, as his explanations lose much of their force in view of these objections. It is gradually becoming evident that a rich field for cultivation in psychology lies within the domain of

pathology; that the study of diseases of the brain throws much light upon normal mental processes. In a future edition we hope to find a more thorough investigation of the facts of pathology. Dr. Calderwood has made a distinct advance from the old position, which limited the study of psychology to the facts presented by self-consciousness. In this direction there is room for farther advance. The candor of the author, his critical acumen, and his freedom from irritation in stating or examining opposing views, fit him for the work he is doing in an eminent degree. His style is finished and attractive. The book, with its numerous illustrations, is pleasant reading, and will doubtless reach a third edition. It will be of interest and of service to those who, from lack of familiarity with German, are unable to read the superior work of Wundt, *Grundzüge der physiologischen-psychologie*.

THE GOVERNMENT AGRICULTURAL REPORT.

Report of the commissioner of agriculture for the year 1883. Washington, Government printing-office, 1883. 496 p., 11 pl. 8°.

THE present volume is the twenty-third, we believe, of a series eminently well qualified to excite the curiosity of a scientific inquirer. It must, in truth, be admitted that the volumes of this series are less peculiar, on the whole, than their immediate predecessors, the so-called agricultural portion of the old patent-office reports; but the new dispensation has been odd enough, and it will doubtless be freely commented upon by future historians on this account. Taking the volumes one with another, the investigator will find in them a considerable mass of 'statistics' at which he may well look askance; divers reports 'of divisions' or of specialists, of every conceivable grade of mediocrity, illumined at rare intervals by glints of sense or strength; while occasionally he will come across papers of real excellence. In addition to the official lucubrations, there has generally been published a considerable bulk of twaddle, pure and simple, obtained 'by favor of representative farmers,' and published, evidently, for the purpose of pleasing the writers. Such men are, in truth, representative specimens of the class which finds comfort and satisfaction on seeing its name in print. People of this sort have always hung like an incubus on the agricultural newspapers of the country, in spite of all the asphyxiative devices known to editors; but it is specially

offensive to behold them emblazoned on the very escutcheon of the greatest nation on earth,—on the facet, namely, presented by one of the most conspicuous of the governmental establishments. It is but mild reproof to say that the department of agriculture has, from the beginning, kept well behind and below the standards of science and knowledge actually existent in the country. With regard to the matter of statistics, it is gratifying as well as in some sort amusing, to be assured officially that they are now valuable. The commissioner says (p. 9), "The division of statistics has never done better work than in the past year. It has advanced its standing for accuracy and breadth in this and in foreign countries. *Its aim is in direct contrast with the prevalent haste and superficiality of the day, towards completeness and fulness of statement, a true parallelism in comparison, and legitimacy in deduction,*"—a sentiment so elevated that we are constrained to print it in italics.

So long as men are men, there will doubtless be found two opposing camps to debate the question of the barren fig-tree. There will be those to cry, 'How long, O Lord, how long?' and to pray for means of radical destruction; while others of sanguine mood, together with all those who find comfort and shelter in the shadow which the tree casts, will insist on the continuance of processes of manuring, watering, grafting, capriciating, tinkering, and cossetting, even to the end of time. Thanks to such fostering care, the department of agriculture continues to live its life; and it is but fair to say, that, for the year now in question, some of its twigs or branches do give evidence of a certain vigor and comeliness. The reports of the entomologists in particular, and of the veterinarians, are noteworthy and praiseworthy. Professor Riley's report shows, as usual, the hand of a master in all its parts. Some of the experimental work relating to the destruction of insects will be found interesting by not a few general readers, more especially the results of trials of emulsions of petroleum used as insecticides. The discovery that petroleum can be applied in this way is manifestly one of very great practical importance for farmers, gardeners, and vine-dressers. Professor Packard's report on the causes of destruction of evergreen forests in northern New England and New York is full of interest and instruction. It is an excellent example of the manner in which technical scientific reports should be written.

Dr. Salmon's report on the work and plans of the veterinarians is indicative of scientific

enlightenment and of high ambition. The tone, withal, of a good part of his report, is excellent. To follow in the footsteps of Pasteur and Koch in the study of contagious diseases, to popularize the results of these investigators, and to surpass their results when possible, are certainly aims worthy the aspiration of any man. But the sympathizing reader cannot avoid the thought, that, while anticipation must necessarily come before fulfilment, past history most distinctly teaches that high hopes of future deeds and glory are wholly out of place in the offices and laboratories of the American agricultural department. The methods of Pasteur not only require intelligence, experience, scrupulosity, and the peculiar knack or good judgment which constitutes the so-called gift for experimentation, but the experimenter must needs have composure of mind, and a sense of continuity; i.e., a reasonable certainty of furtherance and support from year to year, such as a connection with the department of agriculture is little calculated to give. One of the chief objects of Dr. Salmon is said to be to discover the best means of introducing and diffusing the European methods of inoculation for rendering fowl, cattle, sheep, and hogs, insusceptible to various contagious diseases. To an ordinary citizen it would have seemed manifest that the veterinary profession throughout the country must be a fitting vehicle, both for the conveyance of the necessary viruses, and the application of them. It would seem, too, as if the members of the veterinary profession, if anybody, would be keenly alive to the duty of procuring the needful 'attenuated virus,' even if the object had to be studied in European laboratories. Where such enormous money interests are at issue, and open, for that matter, for the remuneration of competent practitioners, it seems well-nigh incredible that the profession should idly await the action of a government official before advancing upon the common enemy with all the appliances of modern warfare. It is plain enough that the protection of domestic animals from contagious diseases is a subject which must necessarily become very prominent in this country in the near future; and time alone can tell how the doings of the unattached veterinary doctors will compare with those of their brethren in government employ. But assuredly there must be some misconception lurking in the minds of the department officials, if they really suppose that the veterinary profession is necessarily incompetent to deal with a problem because, forsooth, the known methods of solving it happen to be

delicate and expensive. We would have argued, rather, that it would be distinctly discreditable to the profession in this country, unless it should be found foremost in applying known remedies of approved efficacy.

THE PANTHER-CREEK COAL-BASIN.

Second geological survey of Pennsylvania, A. A. First report of progress in the anthracite coal region. The geology of the Panther-Creek basin, or eastern end of the southern field. By CHARLES A. ASHBURNER. Harrisburg, Survey, 1883. 47+407 p., 7 pl. 8°.

THERE is evidently some divergence of opinion as to what is the proper scope of, and what the best method of conducting, a geological survey. All, undoubtedly, would admit, to the public at least, that its primary object is the development of the mineral resources of the region under survey. As to whether, for the accomplishment of this purpose, it is better to devote the main part of the work to those general questions which form the basis of all geological investigation, making the practical application of geology to economic ends a secondary matter, or whether, on the other hand, it is better to lay more stress upon the practical solution of the problems of most pressing economic importance, and let the facts which bear upon the general questions slowly accumulate, to be treated systematically later on, there is, however, less unanimity.

The second geological survey of Pennsylvania has apparently followed the latter system; and Mr. Ashburner's work in the anthracite regions is among the best specimens of this kind of work. In his prefatory letter he says, —

"My principal object has been to make the results of the survey practically useful to those directly interested in the exploration and exploitation of the anthracite fields; and therefore the work in the field has been prosecuted under the constant review of those connected with or engaged in the mining of coal.

"The policy of pushing the purely geological and mining work of the survey at the outset, in order that practical men might see some results, and be able to judge their utility, not only to themselves, but to all having interest in the anthracite region, has proved a wise one. The publication (in advance of the report) of 13 atlas sheets, accompanying this report, has already secured to the survey the support of every one in the region, from the miner engaged in cutting coal in the mines, to the presidents of coal transportation companies, all of whom were unanimous in urging the appropriation which was made by the legislature of 1883."

The maps themselves have already been referred to in this journal (vol. i, p. 309). The

present report is practically a series of explanatory sheets accompanying the maps, it being intended, after the survey of the entire region is completed, to publish two volumes summarizing the results, — one on descriptive, the other on systematic geology.

Besides the explanations of atlas sheets and sections, which will find ample criticism and verification at the hands of the multitude who will practically use them in the field, the volume contains some practical investigations into the character and composition of the different coals; the amount of coal already mined, and that which probably remains in the basin, not yet taken out; together with an elaborate description of the methods employed in preparing the various maps, and in obtaining these results.

In no scientific work is the personal equation of the observer so large as in geological investigation; and it would be well if all our geological workers felt as Mr. Ashburner does when he says, "In the case of a public survey, I believe that all the facts which are used in any investigation should be clearly stated, so that, from a personal examination of the subject by an expert, the results can be accepted with confidence, or can be rejected with reason."

In estimating the amount of commercial coal under a given area, Mr. Ashburner first develops each bed upon a horizontal plane, to obtain the actual area of the bed, and then calculates the average thickness of coal, not only from measured sections, but from practical results of shipment from different mines; he also wisely distinguishes the regular from the overturned dips, as the amount of marketable coal obtained from beds in the latter position is very much less than the average.

In comparing the thus calculated amount of coal originally contained in the Panther-Creek basin with the amount that has been taken out since the commencement of mining, in 1820, he finds that only twenty-seven per cent has been sent to market as fuel; while thirty-two went to the dirt-banks as refuse, and forty-one per cent was left in the mines for roof-supports, etc. A practical loss of seventy-three per cent of all the coal in a given bed seems much too large, and suggests wasteful methods of mining and preparing. That these have already been somewhat improved, is shown by the same figures for the years 1881 and 1882, when the percentages are respectively forty-six, twenty-four, and thirty, or a loss of only fifty-four per cent.

The fact that the analysis of bony coal taken from the dump of one of the collieries (p. 181)

gives a higher percentage of fixed carbon, and less ash, than the analyses of coal sent to market from the same colliery, would seem to suggest one way in which present processes might still be improved.

Mr. Ashburner recognizes the insufficiency of present methods of the analysis of coal as a means of determining its relative value as a fuel, and it is to be hoped that his future investigations will result in some practical improvement in them. In a paper in this journal (No. 58), he has already pointed out to its readers that the previously received estimate of the percentage of fixed carbon in anthracite is too high.

At the close of the chapter containing the many vertical sections obtained of the coal series, showing the respective coal-beds in each, Mr. Ashburner remarks, that no attempt has been made to systematize them, and that he believes that it would be impossible to do so. He then proceeds to point out some of the many inconsistencies in the existing nomenclature of coal-beds, but fails to note the reason for these inconsistencies. They arise from the assumption that a given coal-bed is continuous over the entire area of a basin; whereas the fact is, that, while a certain series of rocks may be regarded as coal-bearing throughout the basin, individual coal-beds are of only limited continuous extent; the coal having been formed in small, interrupted areas, not in one broad, contemporaneous sheet over the whole area.

The appendix contains a paper by Mr. Arthur Winslow, on the use of stadia measurements in surveying. This very simple, and by no means new, substitute for chaining, is, Mr. Ashburner remarks, not generally used by surveyors in the region; but we doubt, from what we know of the average surveyor, if Mr. Winslow's use of the calculus in its discussion will add as much to its favor in their eyes as the few practical tests which follow.

MINOR BOOK NOTICES.

Logarithmisch-trigonometrische tafeln mit fünf decimalstellen. Bearbeitet von Prof. Dr. TH. ALBRECHT, Sectionschef im königlichen preussischen geodätischen institut. Stereotypausgabe. Berlin, 1884. 16+172 p. 8°.

In *Science*, vol. ii. p. 174, the six-place tables of Dr. Albrecht were spoken of with the praise which they deserve. They will be found superior to any other six-place tables. It is harder to make an improvement in five-place tables, since we already have many excellent tables of this kind. But Dr. Albrecht

has made an improvement here, in the arrangement of the logarithms of numbers in single entry. The logarithmic sines and tangents are given for every second of arc up to $3^{\circ} 0' 0''$; and the type of the main trigonometric table, together with its very convenient tables of proportional parts, makes this superior, on the whole, to any other similar one. A material improvement has also been introduced in the table of addition logarithms.

The formulæ at the end are convenient, and not superfluous. They are elegantly arranged (see the black-faced type on p. 157, for example), and are such as are always needed. The table of constants, as in his six-place tables, is very full and most practical. A few electrical data might, perhaps, have replaced Gauss' formula for the date of Easter with advantage. This is, no doubt, the very best five-place table for general use, and exactly suited for use with students.

Topographical surveying. New York, D. Van Nostrand, 1884. (Van Nostrand science series, No. 72.) 210 p. 24°.

THE four papers which have been republished in this book, upon methods in surveying, more particularly adapted to topographical work, were first printed in *Van Nostrand's engineering magazine*. The one by George J. Specht explains the use of the stadia, with a telescope having additional horizontal wires, so that distances may be obtained without measurement. The application of photography to topographical surveying, as developed by the French engineers, so that the adjustment of two or more views of the same objects in a landscape to their proper positions on a sheet will enable these objects to be platted with their proper distances and elevations, is explained by Prof. A. S. Hardy. Applications of the geometry of position to some problems in surveying are given by John B. McMaster, — a method of solution which depends upon intersections of lines, and does not seem so convenient, expeditious, or accurate as other methods long and well known. The use of rectangular coordinates for the location and description of

points is urged and illustrated by Henry F. Walling. All of these papers are necessarily brief, but serve to give some useful hints to the topographer. A more careful proof-reading would save a young surveyor from a little perplexity in knowing what is meant by some statements.

Dynamic electricity, including, 1°, Some points in electric lighting, by Dr. JOHN HOPKINSON; 2°, On the measurement of electricity for commercial purposes, by JAMES N. SHOOLBRED; 3°, Electric-light arithmetic, by R. E. DAY. New York, Van Nostrand, 1884. 4+167 p. 24°.

DR. HOPKINSON'S lecture before the Institution of civil engineers is an excellent treatment of the many analogies between the mechanical theory of electricity and the science of hydraulics. The student will find in this lecture a description of Maxwell's apparatus for illustrating the laws of induction, which has not found its way into any other treatise on electricity. A very pretty analogy between the action of the hydraulic ram and the extra current of induction is also given by Dr. Hopkinson. It is also shown how alternating dynamo machines can be run on the same circuit in order to assist each other, — a problem which has been considered by some unsolvable. The equations which illustrate the theory of the dynamo-electric engine are grouped together, and their practical use is shown. The author briefly refers to his improvements in the Edison dynamo, and gives an estimate of the cost of incandescent lighting. Dr. Hopkinson thinks that the efficiency of the carbon-filament lamp will be very much increased. These lamps have not been in the market more than three years, and it is reasonable to suppose that the coming three years will see great improvements in them. The prospect that the electrical incandescent light will be the light of the future seems a very good one.

The paper by Mr. Shoolbred gives an excellent account of the various meters invented by Edison, Sprague, Hopkinson, Boys, Ayrton and Perry, and others. Mr. Day's treatise on electric-light arithmetic is a useful one for the electrical engineer.

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

U. S. geological survey.

Division of chemistry. — Prof. F. W. Clarke is examining a collection of waters from the Virginia hot

springs, and is also beginning a series of experiments upon the synthesis of silicates by the wet method. — Dr. T. M. Chatard has completed a research upon a new method of estimation of alkalis in silicate analyses.

Dr. F. A. Gooch began work in the laboratory on the 2d of April, and since that time has been occupied almost exclusively with analyses of spring-deposits and rocks collected in the Yellowstone national park. He has completed analyses of waters from the Giantess geyser, and the Excelsior spring (or geyser), both in the park, and of a basalt from the same region, and a rhyolite from Washoe, Nev. — Dr. Henry Erni also began work in April, and has been engaged in various mineral determinations of a qualitative character; notably, upon an alleged tin ore from Clay county, Ala., and phosphatic rocks and marls from Mississippi and Alabama.

The following analyses have also been made at the laboratory at Washington: galenite from near Washington; chlorite from Georgetown, D.C.; nephrite from Point Barrow, Alaska; margarite from Gainesville, Ga., and Iredell county, N.C.; copper ore from Lee's ferry, Arizona; fulgurite from Mount Thielson in Oregon; and water from Bear River in Utah. The latter was collected by Mr. I. C. Russell, and proves to be an ordinary river-water; the greatest impurity being carbonate of lime, of which there are contained .1080 of a gram to the litre, the total solid contents being .1845 of a gram to the litre. The fulgurite was collected by Mr. E. E. Hayden, and is being made the subject of special study by Mr. J. S. Diller. Some of the results of his examination will be given in a future number.

In the New-Haven laboratory, during March, Messrs. Barus and Hallock continued their high-

temperature observations. Most of the work has been done with thermo-electric couples. The boiling-point of mercury has been redetermined with great accuracy. During April the boiling-point of zinc was the subject of study. It seems probable, from the present outlook, that these high-temperature researches will be very satisfactory in their results, and that they will render possible a wide range of investigations hitherto impracticable in the domain of physical geology.

In the laboratory at Denver, Mr. Hillebrand has been busy with the chemical examination of rocks from the Silver-Cliff district. He has proved the existence, at this locality, of several minerals not hitherto known to occur in North America. The results of his examinations also point to the existence, in one of these minerals, of silver in a very rare form, if, indeed, not in a combination hitherto unknown in the mineral kingdom. In March, eleven rock specimens were analyzed, and a number of interesting minerals from Ouray, Col. (some of them probably new to science), were examined.

In the laboratory at San Francisco, Dr. Melville was busy, in March and April, with routine work connected with Mr. Becker's investigations.

Paleontology. — Prof. O. C. Marsh, in April, had two field-parties at work in Jurassic beds in Wyoming Territory, and one in the Jurassic in Colorado. Although the weather was very unfavorable during a great part of the time, interesting results were obtained.

RECENT PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Engineers' club, Philadelphia.

May 17. — The secretary presented for Mr. Edward Parrish an illustrated account of the effect of sea-water on the iron of Brandywine shoal lighthouse. This lighthouse was built in 1849-50, near the mouth of the Delaware Bay, and stands in about six feet of water. It was the first screw-pile structure built in the United States, and had but few predecessors in the world. The house is supported on nine piles of hammered iron, surrounded by fifty-two piles of rolled iron, acting as an ice-fender. The whole is strengthened by systems of braces and ties. The effect of the water on the iron, continually submerged, has been to produce longitudinal seams or grooves, with occasional holes on the surface, in some cases seriously reducing the strength. The most extensive corrosion is observed on the hammered iron. Round rods in the air are altered in section, approximating an irregular polygon with longitudinal grooves. — Prof. L. M. Haupt read a paper on rapid transit, giving valuable data relative to the effects of velocity of movement on the ratio of increase of population, and contrasting the situation in New York and Philadelphia. In comparing the topography of the two cities,

a silhouette of Manhattan Island was laid on a map of Philadelphia (same scale), showing that the island, from the Battery to 150th Street (nine miles and a half), only extended from League Island to Erie Avenue. From this it was inferred, that, if there was need for elevated roads in New York, there was greater need for them in Philadelphia, "as the necessity is proportional to the extent of surface of a city, and the distance of its residents from the business centres." The former commercial supremacy of Philadelphia was considered, with the reasons for the rapid decline in the ratio of increase of population, which has diminished from seventy-nine per cent in the decade 1840-50, to twenty-five per cent for 1870-80; while Camden's population has increased from fifty-one per cent in 1850-60, to a hundred and eight per cent in 1870-80. In short, Philadelphia is overflowing because her time-limits of travel are too restricted. Assuming the time-limit at thirty minutes each way, or one hour per day, at the usual velocities of travel, the limits of the 'Pedestrian city' were found to be a square with diagonals of 4 miles, and area 8 square miles; 'Horse-car or cable city,' were found to be a square with diagonals of 6 miles, and area 18 square miles; 'Elevated railroad city,'

were found to be a square with diagonals of 12 miles, and area 72 square miles; 'Underground city,' were found to be a square with diagonals of 20 miles, and area 200 square miles. The total area of Philadelphia is 129 square miles, and, of the built-up portion, 13½, or ten and a half per cent. Deducting from the square representing the 'Street-car city' the salient intercepted by the Delaware River, it leaves just the same area, or 13½ square miles, showing the city to have reached the limit of street-car travel. The areas benefited vary as the squares of the velocity of travel: hence elevated roads would be worth to the city four times as much as surface lines, and underground roads about eleven times as much. Since 1850 Philadelphia has lost, in population, one-half a million people, equivalent to a revenue, on the real estate which they would have occupied and improved, of about two million dollars per annum. The two broad zones of the overcrowded portion of the city were also outlined; and the extent of the benefits to be conferred by only two lines of elevated roads were clearly shown, by diagrams, to extend to the entire city. Elevated roads occupy an intermediate position in cost of construction, rate of travel, and general utility, between surface and underground structures; and there can be no doubt that the time has fully arrived when this city, for her own sake, requires them, and should heartily co-operate with any parties so proposing to improve and extend her resources. The following were some of the conclusions arrived at: 1°. The city has reached and already surpassed the ordinary limits of street-car travel. 2°. The ratio of increase of population is rapidly declining, chiefly from lack of more rapid and cheaper means of transit. 3°. The present steam-roads in the city cannot supply the demand, as they have surfaceline trains, which must move slowly, and cannot be run at close intervals: fares are too high, and stations too distant. 4°. Camden, N.J., is rapidly gaining population at the expense of Philadelphia. 5°. The annual loss to the city in revenue, from the cause, will reach millions of dollars. 6°. Unless relief is afforded, the city will be corralled by time-limits, and the density of the population must increase rapidly at the expense of health and morality. 7°. Two lines of elevated railroads at right angles to each other, and properly located, would benefit an area equal to double that of the built-up portion of the city. 8°. The fears of opponents of elevated roads, of losses to the city or the individual from withdrawal of patronage or depreciation of property, are shown by experience in New York to be groundless. 9°. If Philadelphia desires to retain even the present low rate of increase in population, and high rate of salubrity, she must promptly respond favorably to the request of her citizens to be permitted to build elevated roads. 10°. The limits of the city are not such as to warrant any corporation in building an underground road, were it recommended or allowed, with any fair prospect of returns for many years. — Mr. William H. Ridgway read a paper upon the action of water in the modern turbine, claiming that it is nothing more than an improved Barker's mill, and that there is no such

thing as the water spurting through the shutes, and impinging on the buckets, as is generally believed; the wheel, on the contrary, taking a velocity very much greater than that of the inflowing water. — Mr. J. J. de Kinder presented an illustrated description of a method of removing condemned machinery by dynamite, as practised by him in the case of the side-levers of the old Cornish pumping-engine at Spring Garden water-works, Philadelphia, which weighed twenty-nine thousand pounds each. Drilling, tapping, and breaking each beam in two, with half a pound of dynamite, and without injury to the building or other machinery, occupied thirteen hours. Even had despatch been unnecessary, it might have taken two weeks to do this work by the ordinary methods.

Academy of natural sciences, Philadelphia.

Botanical section, May 12. — Mr. Thomas Meehan referred to his theory that a fasciated branch is due, not to 'over-luxuriance' of life, but to a degradation of vital power, as published before the American association in 1870. A number of phenomena, conceded to result from low vital conditions, were considered by him to be inseparably connected with fasciation, the essential feature of which is the production of an extraordinary number of buds, with a corresponding suppression of the normal internodal spaces. This is precisely the condition of a flowering branch; and all its attendant phenomena find their analogue in a fasciated stem. Taking the test of vital power as the ability to retain life under equal circumstances, we find the leaves on a fasciated branch dying before those on the rest of the tree. In severe winters the branches in the fasciation wholly die in many cases, while those on other portions of the tree survive. Precisely the same circumstances attend inflorescence. The leaves, in their procession from a normal condition to petals, lose this evidence of vitality in proportion to the degree of transformation. The petal dies before the sepal, the sepal before the bract, and the bract before the leaves, in the general order of anthesis in a compound flower; though there are cases, where, secondary causes coming into play, this rule may be reversed. In a general way, however, the soundness of the point would not be disputed. From all these facts in analogy, it might be said that a fasciated branch is an imperfect and precocious attempt to enter on the flowering or reproductive stage.

Natural science association, Staten Island.

May 10. — Mr. Hollick read a paper upon recent discoveries of Indian implements at Tottenville, describing in detail the net-sinkers and hammerstones. These latter, according to Mr. Rau, were employed as hammers, "since they show the most distinct traces of violent contact with hard substances." The Tottenville hammerstones, with two exceptions, are made of soft sandstone, evidently with no intention of using them upon any hard substance; and there seems to be no doubt that in this locality they were used in cracking the oysters among whose shells they are so

plentifully found. Muncy, Penn., where Mr. Rau found his specimens, is on the banks of the Susquehanna, and no doubt shell-fish were caught and eaten there as at Tottenville; but this explanation of the use of the hammerstones does not seem to be insisted upon by him. The Tottenville specimens are made of such soft stone that one can hardly imagine any other use to which they could be put. The number of net-sinkers in use must have been immense, as even at the present time, upon the surface of the ground, they may be picked up in considerable number. One day, in about half an hour, fourteen were found. The extent of these shell-heaps can only be computed in acres. — Mr. George F. Kunz of New York presented a stone head found near Clifton, Staten Island, about two hundred feet east of the railroad just above the Fingerboard Road, in a low swamp filled with the roots of the swamp-oak. A rustic-basket worker, named James Clark, came upon the stone head while digging up the roots of a high huckleberry-bush, at least ten years of age, growing at the edge of the swamp. The soil is a compact, light creamy brown, sandy clay, in which a stone like this could be buried for an age without much disintegration. When striking in his pick, at a depth of from twelve to eighteen inches, he turned up the head, his pick striking and indenting the chin. The material of which it was formed is a brown sandstone, apparently more compact than the common New-Jersey sandstone, and composed almost entirely of grains of quartz, with an occasional small pebble. The weight of the head is about eight pounds, its height seven inches, and it measures four inches through the cheeks, six inches from the tip of the nose through to the back of the head, and an inch and seven-eighths across the nostrils. The eyes are an inch and a quarter long, and five-eighths of an inch wide; they are raised in the centres, and have a groove running around close to the lids. A round hole a fifth of an inch deep had been drilled in the lower part of the nose, in the space between the two nostrils, evidently designed for a nose ornament, and both nostrils were hollowed out. The cheeks, in their lower part, are sunken in a very curious manner, causing the cheek-bones to stand up very high. The forehead is low, and retreats at an angle of sixty degrees. A trace of what had been or was to be the ear is perceptible on the right side. The back and upper parts of the head are almost entirely rough and unworked, as if it had never been finished, or was originally a part of some figure. The surface is rough and slightly weathered; the cheeks, forehead, and chin having single grains of sand apparently raised above the surface, as if by age and exposure. The discoverer, in cleaning it, had scraped the eyes and beneath the nose with a nail, and his shovel had formed a groove in one of the cheeks, — all of which scratches or marks have a very different appearance from the general surface, and are plainly recent. The style is Mexican, or still more resembles Aztec work.

Minnesota academy of natural sciences, Minneapolis.

May 6. — Mr. Warren Upham described three remarkable chains or series of lakes observed in Mar-

tin county, Minn., during his examination of that region as assistant on the state geological survey. These are familiarly known as the east, central, and west chains of lakes. The east chain extends twelve miles from north to south, and includes nine lakes, which vary from a half-mile to two miles in length. About five miles farther west, the central chain of lakes, parallel with the foregoing, reaches about twenty miles in an almost perfectly straight north to south course, including nineteen lakes of similar size with those of the east chain. The west chain is some thirty-five miles long, and is made up of about thirty lakes. Its course is south-south-east, beginning at Mountain Lake in Cottonwood county, and extending to Tuttle's Lake on the line between Martin county and Iowa. The surface of this region is everywhere a prairie of unmodified glacial drift or till, with no considerable deposits of gravel and sand. Its contour is moderately undulating, averaging twenty-five to forty feet above the lakes, the shores of which rise to this height in steep banks or bluffs. No other lakes arranged in such series have been observed, either in this state or elsewhere. The explanation of their origin which seems most probable is, that they mark interglacial avenues of drainage, occupying portions of valleys that were excavated in the till, after ice had long covered this region, and had deposited most of the drift-sheet, but before the last glacial epoch, which again enveloped this area beneath a lobe of the continental glacier, partially filling these valleys, and leaving along their courses the present chains of lakes. — Mr. Upham also briefly described the belts of knolly and hilly drift, which have been traced through Minnesota by the geological survey. Nearly all of these belts are believed to be terminal or marginal moraines, accumulated along the boundaries of the ice-sheet of the last glacial epoch, as moraines are formed at the end and along the sides of alpine glaciers. The outermost morainic belt, running in a looped course across Wisconsin, Minnesota, Iowa, and Dakota, marks the farthest limits of this ice; and other belts of such drift accumulations, found at various distances back from this, mark stages where the ice halted in its departure. These drift hills and knolls are finely developed on the Coteau des Prairies, in south-western Minnesota and eastern Dakota, as also on the Coteau du Missouri, farther west. They surround Lake Minnetonka, and reach to the west edge of Minneapolis; they are also seen between this city and St. Paul, and east and north of St. Paul: indeed, they cover a considerable fraction of the whole state. From Lake Minnetonka a broad belt of morainic drift stretches a hundred and twenty-five miles north-west to the Leaf Hills, where the most massive development of this formation within the state is found, its highest elevations being from one hundred to three hundred and fifty feet above the general level. The outermost belt of these drift-hills has been named the Altamont moraine. No less than ten other morainic belts are distinguishable in Minnesota, showing successive stages in the recession of the ice-sheet. These moraines have been named from localities where they are conspicuously ex-

hibited, as follows, in their order from south to north: the Gary moraine, the Antelope, Kiester, Elysian, Waconia, Dovre, Fergus Falls, Leaf Hills, Itasca, and Mesabi moraines. The last of these crosses the northern part of the state, from the head waters of the Mississippi River, to Grand Portage on the north shore of Lake Superior. — Mr. C. F. Sidmer gave some account of the manufacture of the Chamberlain illuminating-gas, made of petroleum, water, and air, and called attention to some of its advantages.

NOTES AND NEWS.

THE following is a complete list of the papers read to the scientific sections of the Royal society of Canada, at its recent meeting in Ottawa, of which an account is given elsewhere in this number:— In the physical section: F. N. Gisborne, Electrical induction in underground and aerial metallic conductors; C. Baillargé, A particular case of the hydraulic ram, or water-hammer; R. Steckel, The form of the contracted liquid vein, affecting the present theory of the science of hydraulics; T. Sterry Hunt, The origin of crystalline rocks; J. G. MacGregor, The density and the thermal expansion of aqueous solutions of sulphate of copper; E. Haanel, Blowpipe re-actions on plaster-of-paris tablets; Description of apparatus for distinguishing flame-coloring constituents when occurring together in an assay; T. E. Hamel, Essai sur la constitution atomique de la matière; N. F. Dupuis, The algebraical development of certain functions; E. J. Chapman, Contributions to our knowledge of the iron ores of Ontario; J. C. K. Laflamme, Note sur une fait météorologique particulier à Quebec. In the geological and biological section: A. R. C. Selwyn, Note of observations, in 1883, on the geology of a part of the north shore of Lake Superior; George Lawson, Revision of the Canadian Ranunculaceae; J. W. Dawson, Geology and geological work in the old world, in their relation to Canada; T. S. Hunt, The Taconic question in geology; W. Saunders, Note on the occurrence of certain butterflies in Canada; E. J. Chapman, Some deposits of titaniferous iron ore in the counties of Haliburton and Hastings (Ontario); Mimeticism in inorganic nature; T. J. W. Burgess and J. Macoun, A monograph of Canadian ferns; L. W. Bailey, Geological contacts and ancient erosion in the Province of New Brunswick; G. F. Matthew, Illustrations of the fauna of the St. John group (part iii., Conocoryphidae, with notes on the Paradoxidae); G. M. Dawson, The glacial deposits in the neighborhood of the Bow and Belly Rivers; R. Bell, The geology and economic minerals of Hudson's Bay and northern Canada; J. C. K. Laflamme, Note sur certains dépôts aurifères de la Beauce; Découverte de l'émeraude au Saguenay; J. F. Whiteaves, A description of a supposed new ammonite from the upper cretaceous rocks of Fort St. John on the Peace River; On a new decapod crustacean from the Pierre shales of Highwood River, N.W.T.; E. Gilpin, Notes on the manganese ores of Nova Scotia; D. Honeyman, A revision of the geology of Antigonish county, Nova

Scotia; S. Obalski, Notes sur la constitution géologique de l'apatite Canadienne.

— It is to be hoped that there will be no lack of papers from chemists on this side of the Atlantic before Section B of the British association, and that the titles will be sent in as early as possible to Prof. H. E. Roscoe, president of Section B, British association, P.O. box 147, Montreal. The subjects for special discussion, as already announced, are, 1°, The constitution of the elements; 2°, Chemical changes in relation to micro-organisms. The first will be introduced by Professor Dewar, probably on Friday, Aug. 29; the second, by Professor Frankland, on Monday, Sept. 1.

— The land-office maps of the United States, and of certain of the states and territories, give a fair outline of our horizontal topography, with rough mountain shading, and, in addition to this, present various details — concerning public lands and land-offices; Indian, military, naval, and lighthouse reservations; railroad and large private grants, confirmed and unconfirmed — not to be found in our ordinary atlases. The latest edition, issued under the direction of Hon. N. C. McFarland, commissioner, includes the general map of the country, six and a half by four feet, dated 1883, on a scale of 40 miles to an inch; Alabama, 1882, 12 miles to an inch; Arizona, 1883, 15 miles; Colorado, 1881, 15 miles; Dakota, 1882, 18 miles; Florida, 1883, 12 miles; Idaho, 1883, 16 miles; Indian Territory, 1883, 12 miles; Louisiana, 1879, 14 miles; Minnesota, 1884, 15 miles; Montana, 1883, 18 miles; New Mexico, 1882, 16 miles; Utah, 1884, 15 miles; Washington, 1883, 15 miles; Wyoming, 1883, 15 miles. These state maps have the coasts, river-lines, townships, lettering, etc., in black; water-areas in blue; and reservations in red or green. Although we have to lament the lack of adequate representation of the relief of the land, the maps cannot be adversely criticised on account of this want; for the measurement of the vertical element of our topography has never been undertaken by the land-office: its work has been simply to measure off the public lands for sale, and to present such maps of the surveyed districts as shall serve to locate the various townships and sections. In the western mountainous region, the land-surveys follow only the lower country, and the adjacent mountains are merely roughly sketched; indeed, in some cases so roughly as to lose all of their characteristic form. But, on the other hand, some of the open country is shown in finer, or at least in *more*, detail than on any other maps yet published. Thus we find the lake districts of Florida and Minnesota well illustrated; and the number of lakes and ponds dotted over the plains of Colorado gives a clew to a peculiar chapter in their physical history. So, also, the branching and meandering of rivers in the Mississippi valley are drawn with greater variety of form, and hence, we may suppose, with a nearer approach to precision, than in our common atlases.

The post-office department also has a series of post-route maps, grouped in areas of several states together, and prepared especially for office use. The

latest edition consists of sixty-one sheets, dated 1884, with manuscript corrections to April 1, published by order of postmaster-general W. Q. Gresham, under the direction of C. Roeser, jun., topographer, post-office department. They are printed in black outline, on a scale varying from six to fifteen miles to an inch, with state and county boundaries tinted red, and show all cities, towns, and villages having post-offices, with many more besides; all post-routes, whether by rail, boat, or stage, with the distance between offices; and a conventional coloring to designate the frequency of the mail-service. Rivers and the larger streams and lakes are represented, but often without name; mountains are not shown, except on a few of the newer western sheets. Apart from their original use, these maps, therefore, serve simply as a basis for additional work, and are best adapted to studies of a statistical character.

—The new journal of astronomy, *Bulletin astronomique*, lately reviewed in *Science*, begins, in its third number (March, 1884), an interesting series of articles relating to the observatories of France. Stephan, director of the observatory at Marseilles, gives a brief description of the astronomical establishment at that place, with statements as to the nature of the work done since he was appointed director, in 1866. The construction of the observatory was begun in 1862, and terminated in 1878. The *personnel* includes, in addition to the director, Borelly and Coggia, adjunct astronomers; Herse, student in astronomy; and Lubrano and Maitre, computers. Eighteen small planets have been discovered (one by Stephan, one by Cottenot, four by Coggia, and twelve by Borelly), and eleven comets (six by Borelly, and five by Coggia). Magnetic and meteorological observations form a part of the regular work. About seven hundred nebulae have been discovered by Stephan.

—The physicist, as well as the astronomer, will find points of interest in a popular article on the theory of heliostats, by Radau, in the *Bulletin astronomique* for March. The paper is illustrated with engravings of the siderostat and heliostat of Foucault, as well as the modified forms of Silbermann and Littrow. A tolerably full bibliography of the subject concludes the article.

—Small planet (236), discovered by Dr. J. Palisa at Vienna, April 26, has been named 'Honorio' by the discoverer. It is a faint object, being of about the thirteenth magnitude.

—The opening of the new archeological museum in connection with the Fitzwilliam museum took place May 6. The new museum will be an institution for the study of archeology, and the exhibition of objects of antiquity. By its opening, Cambridge is the first in the field of universities in the United Kingdom to provide the necessary facilities for archeological study. The classical section will be second only to the famous institution at Berlin, whose collection of antiques is the finest in the world. Cambridge will thus enjoy a unique position in the United Kingdom; for though Oxford has resolved upon following the example of its sister university, and establishing

a similar school, it must — as the project has only recently been decided upon — be some time before it can be brought to maturity. The general direction will be in the hands of Dr. Waldstein, whilst the curatorship of the South-Sea Island department will be undertaken by Baron von Hügel, who, together with Sir Arthur Gordon and Mr. Maudsley, has contributed largely to the magnificent collection of South-Sea Island antiquities.

—The Kentucky pharmaceutical association held its annual meeting at Louisville on the 21st, 22d, and 23d of May. The attendance was an unusually large one, and much interest was shown in the progress of pharmacy and the collateral sciences. Various papers were read, bearing, however, mostly on pharmacy proper; but one of more general scientific interest was reported. It was a paper devoted to the elaboration of a method for the determination of iron by the decoloration of the ferric sulphocyanide by the aid of a definite solution of either mercuric or stannous chloride. The method gave, apparently, very satisfactory results, and has the great advantage of easy application. This paper was by Mr. J. A. Flexuer.

—The programme of the Antwerp exhibition for 1885 is published. It will be under the patronage of the king of the Belgians, and will be opened in May. All industrial products will be included, all goods that are the subject of trade, all materials and tools that in any way concern shipping. The exhibition building will be on the site of the old citadel, near the Scheldt and the new quays, on which space will be allotted for the unloading and shipping of exhibits; the southern railway-station being arranged as a gallery for machinery. There will also be an art-exhibition, a special department for electricity, and one for gardening.

—The Belgian government has sent to the German fisheries department for two hundred and fifty thousand young trout, and fifty thousand young salmon, for the Belgian rivers, and intends to continue their cultivation. Arrangements are being made to allow the salmon to pass through the locks of the River Maas.

—At a recent meeting of the Electro-chemical society of Berlin there were exhibited specimens of a vegetable carbon, made conductive and incombustible by being strongly heated, either *in vacuo* or in a neutral atmosphere. This artificial graphite does not assume the crystalline structure of the native mineral. We have long known that graphite could be formed by the influence of high temperature, under special conditions. It is now shown by Dr. Aron, that, by the same influence, soot can be rendered as good a conductor as graphite.

—A report on the progress of the devastations caused by *Phylloxera* in Hungary has been issued by the Ministry of agriculture and commerce. The report states, that, at the end of 1882, there were eighty-two districts found to have been invaded by the pest, irrespective of the smitten districts in Croatia. In May, last year, the examination of all the

vine-growing districts of the monarchy was resumed, with the result, that, by the end of the year, twenty-nine new districts were found to have been invaded. Measures have been adopted in conformity with the law of February, last year, to combat the evil.

— A recent number of the *Comptes rendus* contains an account of some very remarkable observations of the planets Saturn and Uranus, made by Thollon, Perrotin, and Lockyer, at the Nice observatory, under an extraordinarily favorable condition of the atmosphere. On March 16 the outer of the three rings of Saturn was seen to be made up of three separate rings, of slightly greater breadth toward the ball of the planet; and all of these rings appeared at times to be marked with striae, as if there were indefinite subdivisions. Uranus was observed under similar conditions on March 18, and its general appearance is described as similar to that of Mars; that is, dark spots near the central portions of the disk, and on the limb of the planet, at position-angle 380° , a white spot resembling that seen at the Martial poles. The observers, having taken care to eliminate a possible deception by the position of their instrument, also recorded a difference of tint of the two hemispheres, — dark toward the north-west, and toward the south-east, bluish white.

— We learn from M. Veniukoff, that a general convention or council of the authorities, directing geodetic, hydrographic, and other surveys in Russia, has been held for the purpose of agreeing upon a uniform system of conducting the details of such work, for which the government annually expends nearly a million of dollars. At present a universal discord prevails in methods of measurement and procedure. Messrs. Struve, Tillo, Faddeieff, Pustchin, and others are members of the board, and the Geographical society is represented by several of its members.

— The *Mittheilungen* of the Verein für erdkunde at Halle, for 1883, contains an extensive bibliography of descriptive literature relating to North Thuringia, the Hartz, and the portion of the North German lowlands appertaining to Saxon Anhalt. This bibliography is the collective work of members of the society, and covers a hundred and seventy-three octavo pages. The same number contains an interesting map, showing the boundaries of the middle and low German dialects from Hedemünde on the Werra, to Stassfurt on the Bode River.

— The much talked of literary undertaking of the Austrian crown prince, 'The Austro-Hungarian monarchy in word and view,' is progressing, and will appear in a popular edition. The first volume will give an abridged view of the physical features and historical development and organization of the country. The first section gives in a series of numbers the provinces represented in the *Reichsrath*; the second relates to the Hungarian provinces; the third section is one volume on the occupied provinces; the concluding section gives a view of the agricultural and economical relations of the different branches of the empire, the dynasty, the army, the home and foreign missions, and political situation,

followed by an index of collaborators and references. Each division of the monarchy will find its history, language, literature, customs, and art separately reviewed. The editorship of the Austrian part will be undertaken by Herr Weilen; the Hungarian part, by the poet Moritz Jokai. The expenses will be paid by the emperor. Two subjects in the Austrian part will be undertaken by Prince Rudolph, and one in the Hungarian part. The work will be illustrated with etchings.

— A plant named kappe was shown at last year's Amsterdam exhibition. It is indigenous to Java; and, when its fibres are carefully prepared, they resemble wool, and, when curled, at a moderate cost they can be used for stuffing mattresses. It can also be spun and dyed; but the fibrous appearance it retains shows that a radical improvement in the method of treating it has still to be discovered. All who examined the fibre at Amsterdam were satisfied of its contingent improvement as a textile material.

— The March general meeting of the Russian geographical society was occupied by a communication from Dr. Dybowsky on the Commander Islands, famous for their seal-hunting. Special attention was devoted to the zoölogy. Dr. Dybowsky is the well-known explorer of the fauna of Lake Baikal, and was at St. Petersburg on his way to Lvoff (Lemberg), to occupy there a chair of zoölogy. The April meeting was occupied by an account, by the mining-engineer Tvasroff, on the Pamir expedition of 1883, in which he took part with Capt. Putiata and Benderski. The more is known about this expedition, the more admiration must be felt for the explorers, who did so much under such difficult circumstances. Two more meetings are to be devoted to this expedition, — the May general meeting to the ethnography, and one of the sectional meetings to the physical geography, geology, etc.

— In our last issue we were in error in stating that the board of managers of the Yale college observatory had been abolished. The president of the college has been added to the board, but no decided change in the organization of the observatory will be made till he has become personally acquainted with the needs of the institution.

— The scientific society of Alais, the native place of Dumas, proposes to erect a statue of the famous chemist, and desires subscriptions from all those who felt respect for his name.

— Alphonse Lavallée, the most accomplished dendrologist of our day, died on the 2d of May, at his chateau of Segrez. This is a great and most unexpected loss. A comparatively young man, of apparently robust health, the inheritor of a fine estate not far from Paris, he had devoted his means and his talents to the formation of an arboretum and fruticetum at Segrez, which had already become the best private collection in the world, and to the critical study and illustration of hardy trees and shrubs, with a zeal and ability which inspired the highest hopes, — now, alas! frustrated by untimely death.